

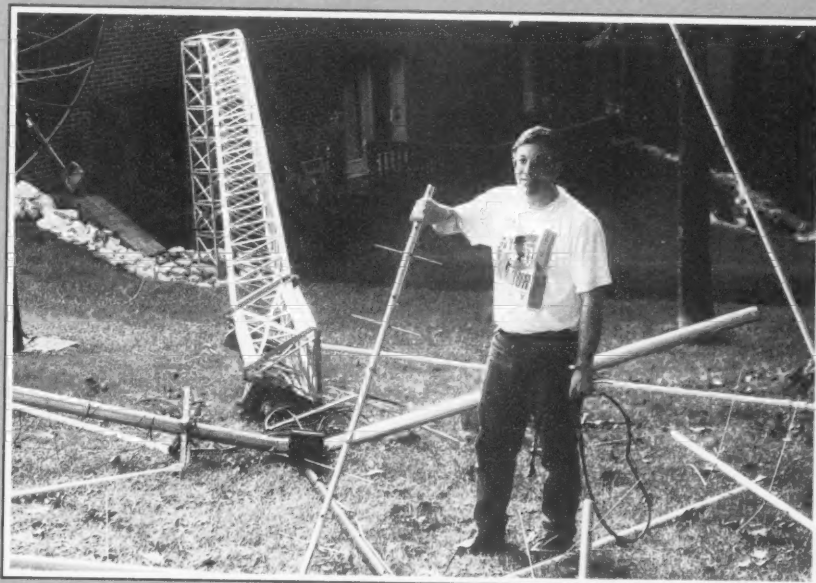
# 73<sup>®</sup> Amateur Radio Today

JUNE 1999  
ISSUE #464  
USA \$3.95  
CANADA \$4.95

You Build It:

Fun Regen Rx

Yes, Another Keyer



Oops! — page 33

Antennas:

Telescoping Mast

10m Circular Quad

A Reference Antenna

Satellite Antenna Saga

Improving Mobile Ante

\*\*\*\*\*5-DIGIT 48103  
#00000191981WR9# JUN76 211  
UNIV MICROFILM 45  
SERIAL PRGNG ATTNL P 1  
300 N ZEEB RD  
ANN ARBOR MI 48103-1553

0 00000191981WR9# JUN76 211 45 P 1

## Get more features for your dollar with our REP-200 REPEATER

A microprocessor-controlled repeater with full autopatch and many versatile dtmf remote control features at less than you might pay for a bare bones repeater or controller alone!



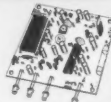
- kit still only \$1095
- factory assembled still only \$1295
- 50-54, 143-174, 213-233, 420-475 MHz. (902-928 MHz slightly higher.)
- FCC type accepted for commercial service in 150 & 450 MHz bands.

Digital Voice Recorder Option. Allows message up to 20 sec. to be remotely recorded off the air. Play back at user request by DTMF command, or as a periodical voice id, or both. Great for making club announcements! ..... only \$100.

REP-200C Economy Repeater. Real-voice ID, no dtmf or autopatch. .... Kit only \$795, w/t \$1195.  
REP-200N Repeater. Without controller so you can use your own. .... Kit only \$695, w/t \$995.

## You'll KICK Yourself If You Build a Repeater Without Checking Out Our Catalog First!

Hamtronics has the world's most complete line of modules for making repeaters. In addition to exciters, pa's, and receivers, we offer the following controllers.

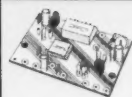


COR-3. Inexpensive, flexible COR module with timers, courtesy beep, audio mixer. .... only \$49/kit, \$79 w/t.  
CWID. Traditional diode matrix ID'er. .... kit only \$59.  
CWID-2. Eeprom-controlled ID'er. .... only \$54/kit, \$79 w/t.  
DVR-1. Record your own voice up to 20 sec. For voice id or playing club announcements. .... \$59/kit, \$99 w/t.

COR-4. Complete COR and CWID all on one board. ID in eeprom. Low power CMOS. .... only \$99/kit, \$149 w/t.  
COR-6. COR with real-voice id. Low power CMOS, non-volatile memory. .... kit only \$99, w/t only \$149.  
COR-5.  $\mu$ P controller with autopatch, reverse ap, phone remote control, lots of DTMF control functions, all on one board, as used in REP-200 Repeater. .... \$379 w/t.

AP-3. Repeater autopatch, reverse autopatch, phone line remote control. Use with TD-2. .... kit \$89.  
TD-2. Four-digit DTMF decoder/controller. Five latching on-off functions, toll call restrictor. .... kit \$79.  
TD-4. DTMF controller as above except one on-off function and no toll call restrictor. Can also use for selective calling; mute speaker until someone pages you. .... kit \$49.

## SUBAUDIBLE TONE ENCODER/DECODER



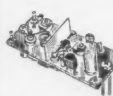
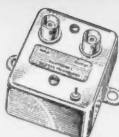
Access all your favorite closed repeaters!  
• Encodes all standard CTCSS tones with crystal accuracy and convenient DIP switch selection.

- Comprehensive manual also shows how you can set up a front panel switch to select tones for several repeaters.
- Decoder can be used to mute receive audio and is optimized for installation in repeaters to provide closed access. High pass filter gets rid of annoying buzz in receiver. © New low prices!
- TD-5 CTCSS Encoder/Decoder Kit ..... now only \$29
- TD-6 CTCSS Encoder/Decoder Wired/tested ..... \$49

## LOW NOISE RECEIVER PREAMPS

### LNG-( ) GAAs FET PREAMP STILL ONLY \$59, wired/tested

- Make your friends sick with envy! Work stations they don't even know are there.
- Install one at the antenna and overcome coax losses.
- Available for 28-30, 46-56, 137-152, 152-172, 210-230, 400-470, and 800-960 MHz bands.



### LNW-( ) ECONOMY PREAMP ONLY \$24/kit

- Miniature MOSFET Preamp
- Solder terminals allow easy connection inside radios.
- Available for 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, and 400-500 MHz bands.

## TRANSMITTING & RECEIVING CONVERTERS

No need to spend thousands on new transceivers for each band!



- Convert vhf and uhf signals to & from 10M.
- Even if you don't have a 10M rig, you can pick up very good used xmts & rcvrs for next to nothing.
- Receiving converters (shown above) available for various segments of 6M, 2M, 220, and 432 MHz.
- Rcvg Conv Kits from \$49, wired/tested units only \$99.
- Transmitting converters for 2M, 432 MHz.
- Kits only \$89 vhf or \$99 uhf.
- Power amplifiers up to 50W output.



## WEATHER ALERT RECEIVER

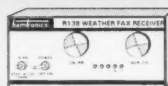
A sensitive and selective professional grade receiver to monitor critical NOAA weather broadcasts. Good reception even at distances of 70 miles or more with suitable antenna. No comparison with ordinary consumer radios!



Automatic mode provides storm watch, alerting you by unmuting receiver and providing an output to trip remote equipment when an alert tone is broadcast. Crystal controlled for accuracy; all 7 channels (162.40 to 162.55). Buy just the receiver pcb module in kit form or buy the kit with an attractive metal cabinet, AC power adapter, and built-in speaker. Also available factory wired and tested.  
RWX Rcvr kit, PCB only ..... \$79  
RWX Rcvr kit with cabinet, speaker, & AC adapter ..... \$99  
RWX Rcvr wired/tested in cabinet with speaker & adapter ..... \$139

## WEATHER FAX RECEIVER

Join the fun. Get striking images directly from the weather satellites!



A very sensitive wideband fm receiver optimized for NOAA APT & Russian Meteor weather fax on the 137MHz band. Designed from the start for optimum satellite reception; not just an off-the-shelf scanner with a shorted-out IF filter! Covers all 5 satellite channels. Scanner circuit & recorder control allow you to automatically capture signals as satellites pass overhead, even while away from home.  
• R139 Receiver Kit less case ..... \$159  
• R139 Receiver Kit with case and AC power adapter ..... \$189  
• R139 Receiver w/t in case with AC power adapter ..... \$239  
• Internal PC Demodulator Board & Imaging Software ..... \$289  
• Turnstile Antenna ..... \$119  
• Weather Satellite Handbook ..... \$20

## SYNTHESIZED FM EXCITER & RECEIVER MODULES



We recently introduced new vhf fm exciters and receivers which do not require channel crystals. NOW... uhf modules are also available!

Exciters and Receivers provide high quality nbfm and fsk operation. Features include:

- Dip switch frequency selection.
- Exceptional modulation for voice and ctcss.
- Very low noise synthesizer for repeater service.
- Direct fm for data up to 9600 baud.
- TCXO for tight frequency accuracy in wide range of environmental conditions.
- Next day shipping. No wait for crystals.

### EXCITERS:

Rated for continuous duty, 2-3W output.

T301 VHF Exciter: for various bands 139-174MHz\*, 216-226 MHz.

- Kit (ham bands only) ...\$105 (TCXO option \$40)
- Wired/tested, incl TCXO...\$189

T304 UHF Exciter: various bands 400-470 MHz\*.

- Kit (440-450 ham band only) incl TCXO ...\$149
- Wired/tested...\$189
- \* for gov't & export use.



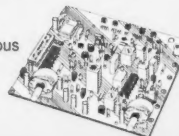
### RECEIVERS:

R301 VHF Receiver: various bands 139-174MHz\*, 216-226 MHz.

- Kit (ham bands only) ...only \$139 (TCXO option \$40)
- Wired/tested...\$209 (includes TCXO)

R304 UHF Receiver: various bands 400-470 MHz\*.

- Kit (440-450 ham band only) incl TCXO ...\$179
- Wired/tested...\$209



## TRADITIONAL CRYSTAL-CONTROLLED VHF & UHF FM EXCITERS & RECEIVERS

FM EXCITERS: 2W output, continuous duty.

- TA51: for 6M, 2M, 220 MHz ..... kit \$99, w/t \$169
- TA451: for 420-475 MHz ..... kit \$99, w/t \$169
- TA901: for 902-928 MHz, (0.5W out) ..... w/t \$169

### VHF & UHF POWER AMPLIFIERS.

Output levels from 10W to 100W..... Starting at \$99

### FM RECEIVERS:

Very sensitive - 0.15 $\mu$ V.

- Superb selectivity, >100 dB down at  $\pm 12$  kHz, best available anywhere, flutter-proof squelch. For 46-54, 72-76, 140-175, or 216-225 MHz. ... kit \$129, w/t \$189
- R144 RCVR. Like R100, for 2M, with helical resonator in front end..... kit \$159, w/t \$219
- R451 FM RCVR, for 420-475 MHz. Similar to R100 above. kit \$129, w/t \$189.
- R901 FM RCVR, 902-928MHz ..... \$159, w/t \$219

## WWW RECEIVER

Get time & frequency checks without buying multiband hf rcvr. Hear solar activity reports affecting radio propagation.



Very sensitive and selective crystal controlled superhet, dedicated to listening to WWW on 10 MHz. Performance rivals the most expensive rcvrs.

- RWWW Rcvr kit, PCB only ..... \$59
- RWWW Rcvr kit with cabt. spkr. & 12Vdc adapter ..... \$89
- RWWW Rcvr w/t in cabt with spkr & adapter ..... \$129

Buy at low, factory-direct net prices and save!

For complete info, call or write for complete catalog. Order by mail, fax, email, or phone (9-12, 1-5 eastern time). Min. \$6 S&H charge for 1" lb. plus add'l weight & insurance. Use Visa, MC, Discover, check, or UPS C.O.D.



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**Good Guy Deals!**



FT-1000D



FT-2600M

**NEW!**

60W 2M mobile



FT-100

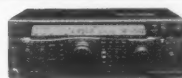
**NEW!**

All Mode HF/6m/2M/440MHz



FT-847

All Mode HF/6m/2M/440MHz



FT-920

All Mode HF/6m  
Free FM-1



**NEW!**



FT-1000MP

**New  
Low Price**



FT-2500  
2M Mobile

**New  
Low Price**



FT-10R



VX-1R

Dual Band Handheld  
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Ultra Compact  
GREAT AUDIO!

2M Mobile  
FT-3000M



FT-8100R

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**New  
Low Price**



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Dual Band HT



FT-51R  
Dualbander



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Dual Band  
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Rechargeable Battery  
& Charger**

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**New IC-706G\*  
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DSP Now  
Included

HF, 6 Meters, & 2 Meters

**ICOM's Coupons Expire June 31st!**



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Dual Band Mobile  
Transceiver

**\$200  
Coupon**  
Free Logbook



IC-821H

**ICOM**

IC-207H



2M/440MHz mobile

**\$30  
Coupon**

IC-T22A

IC-2100H

**New  
Low Price**



6M,  
2M,  
440MHz  
& 1.2 GHz  
IC-T81A\*

**\$20  
Coupon**

IC-W32A



2M/440  
Dual  
Band  
5 watts

IC-T7A/HP  
Dual Band HT



\$177.50

IC-T8A  
6M/2M/440  
Tribander  
5 watts



IC-2710H

IC-756

**Lower Prices!**

IC-2800\*

**New Low  
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**Scanners/Receivers**

NEW  
R-2



R-2



R-8500



R-10

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Free Freq.  
database  
on PCR-1000

**KENWOOD**

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\$447.66

TM-V7

with tone encode &  
tone decode

TH-G71A

Dual  
Band  
HT



TS-570D & TS-570S w/6M  
HF Transceiver with DSP

TH-79AAKSS  
Dual Band HT



VC-H1



TM-261A



Compact 2 Meter Mobile

**NEW!**

DR140TQ

\$159.95 with coupon



**COMET**

**ALINCO  
ELECTRONICS INC.**

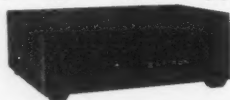
Prices, products and policies may vary between dealer locations.  
Not all dealers have all product lines.  
All prices and promotions subject to change. Not responsible  
for typographical errors. \*Batteries not approved for sale.





## SWITCHING POWER SUPPLIES

	CONT.	ICS	WT.(LBS)
SS-10	7	10	3.2
SS-12	10	12	3.4
SS-18	15	18	3.6
SS-25	20	25	4.2
SS-30	25	30	5.0

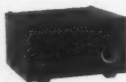


SS-25M With volt & amp meters  
SS-30M With volt & amp meters

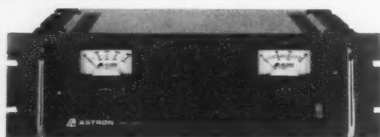
## SL SERIES



## RS-L SERIES



## RM SERIES



MODEL RM-35M

## RS-A SERIES



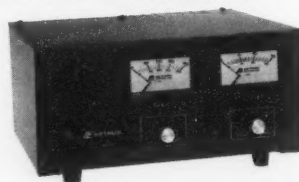
MODEL RS-7A

## RS-M SERIES



MODEL RS-35M

## VS-M AND VRM-M SERIES



MODEL VS-35M

## RS-S SERIES



MODEL RS-12S

## ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

### SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

### PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC  $\pm$  0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

### • LOW PROFILE POWER SUPPLY

MODEL	Colors Gray Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
SL-11A	• •	7	11	2 1/4 x 7 x 9 1/4	12
SL-11R	• •	7	11	2 1/4 x 7 x 9 1/4	12
SL-11S	• •	7	11	2 1/4 x 7 x 9 1/4	12
SL-11R-RA	• •	7	11	4 x 7 x 9 1/4	13

### • POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-4L	3	4	3 1/2 x 6 1/2 x 7 1/4	6
RS-5L	4	5	3 1/2 x 6 1/2 x 7 1/4	7

### • 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RM-12A	9	12	5 1/4 x 19 x 8 1/4	16
RM-35A	25	35	5 1/4 x 19 x 12 1/2	38
RM-50A	37	50	5 1/4 x 19 x 12 1/2	50
RM-60A	50	55	7 x 19 x 12 1/2	60

### • Separate Volt and Amp Meters

RM-12M	9	12	5 1/4 x 19 x 8 1/4	16
RM-35M	25	35	5 1/4 x 19 x 12 1/2	38
RM-50M	37	50	5 1/4 x 19 x 12 1/2	50
RM-60M	50	55	7 x 19 x 12 1/2	60

MODEL	Colors Gray Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-3A	• •	2.5	3	3 x 4 1/4 x 5 1/4	4
RS-4A	• •	3	4	3 1/4 x 6 1/2 x 9	5
RS-5A	• •	4	5	3 1/2 x 6 1/2 x 7 1/4	7
RS-7A	• •	5	7	3 1/4 x 6 1/2 x 9	9
RS-10A	• •	7.5	10	4 x 7 1/2 x 10 1/4	11
RS-12A	• •	9	12	4 1/4 x 8 x 9	13
RS-12B	• •	9	12	4 x 7 1/2 x 10 1/4	13
RS-20A	• •	16	20	5 x 9 x 10 1/2	18
RS-35A	• •	25	35	5 x 11 x 11	27
RS-50A	• •	37	50	6 x 13 3/4 x 11	46
RS-70A	• •	57	70	6 x 13 3/4 x 12 1/4	48

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter RS-12M	9	12	4 1/2 x 8 x 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 x 9 x 10 1/2	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13 3/4 x 11	46
RS-70M	57	70	6 x 13 3/4 x 12 1/4	48

### • Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC @10VDC @5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt. (lbs.)
VS-12M	9 5 2	12	4 1/2 x 8 x 9	13
VS-20M	16 9 4	20	5 x 9 x 10 1/2	20
VS-35M	25 15 7	35	5 x 11 x 11	29
VS-50M	37 22 10	50	6 x 13 3/4 x 11	46
VS-70M	67 34 16	70	6 x 13 3/4 x 12 1/4	48

### • Variable rack mount power supplies

VRM-35M	25 15 7	35	5 1/4 x 19 x 12 1/2	38
VRM-50M	37 22 10	50	5 1/4 x 19 x 12 1/2	50

### • Built in speaker

MODEL	Colors Gray Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-7S	• •	5	7	4 x 7 1/2 x 10 1/4	10
RS-10S	• •	7.5	10	4 x 7 1/2 x 10 1/4	12
RS-12S	• •	9	12	4 1/2 x 8 x 9	13
RS-20S	• •	16	20	5 x 9 x 10 1/2	18
SL-11S	• •	7	11	2 1/4 x 7 x 9 1/4	12



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**ENTER OUR  
CONTEST!**  
— see page 56

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**On the cover:** How'd you like this in your yard? Article begins on page 35. We are always looking for interesting articles and cover photos — with or without each other. Your name could be in this space *next* month, and our check could be on its way to *you!* You couldn't use a little extra cash?

**Feedback:** Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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# NEVER SAY DIE

Wayne Green W2NSD/1



## Kids Killing Kids

Of course we blame the kids. And their parents. We blame the arcade and home video killer games. We blame TV and the movies. We blame comic books. And we try to stop it with laws and metal detectors, making going to school like going through an airport security gate. Every day, several times a day.

So what's going on? And are there any answers as to how to prevent these tragedies? Of course, or I wouldn't have brought it up.

Actually, I've written about these things before, but you weren't paying enough attention.

First, remember what I've explained about what rock music does to plants as compared to classical music? Rock stunts and dwarfs them. And do you remember about the tests with mice where the test had to be stopped after a couple weeks because those exposed to rock were killing each other? I'm not even talking about the lyrics in some rock and rap music, which glorify brutality.

Then there are the mood-altering effects of aspartame (NutraSweet), which make some people fat and others very depressed.

I've reviewed Dr. Rapp's book, *The Impossible Child*, which explains how allergies can trigger all kinds of terrible behavior, depression, attention deficit disorder, and hyperactivity.

I've also written a lot about the damage and mood-altering effects of fluorides in our drinking water.

Then there's sugar. Have

you read Nancy Appleton's *Lick The Sugar Habit* yet? Sugar, too can be mood altering. Maybe you remember the "Twinkie Defense" used in the murder of the San Francisco mayor. "Sugar made me do it."

It's easy to blame guns or videos, but there can be many contributing factors, so savvy parents will do their best to keep their children away from as many of the bad influences as they can. Children can learn to love good music even before they are born. Read *The Prenatal Classroom*, which I have reviewed for you.

My mother read to me from the earliest days I can remember, so I've always enjoyed reading.

Then there's my review of the Lieberman book on light and the research showing how much improved kids' grades are and how they get along so much better with each other when there are full spectrum lights in their classrooms.

Copper can cause psychotic behavior. Most schools have water softening systems which leach copper from the water pipes for the kids to drink.

Another problem for kids has been the side effects of immunization shots. There are several exposés of this medical scam, but the best is the one by Dr. Walene James, which I've reviewed for you.

I haven't done a report on the damage our American milk supply is doing, but I will. Between many people being allergic to cow's milk, plus the antibiotics and growth hormones it now contains,

this is significantly adding to children's behavior problems.

Kids need every break they can get, not medication like Ritalin to control their behavior. They're sent to school after a breakfast of sugar-coated frosties with rBST-laced milk, plus some white toast and jam. Animals fed some of our popular breakfast cereals die of starvation.

## Sugar

It's frustrating. I can't get you to stop eating sugar. I can't even get you to stop feeding it to your kids. I can't get you to read books about sugar, like Nancy Appleton's *Lick The Sugar Habit* (\$6), or Duffy's *Sugar Blues* (\$6). They've reprinted a book I've been looking for by Dr. Weston Price, one of the pioneer researchers in the sugar vs. health field — *Nutrition and Physical Degeneration*. The data is 60 years old and as relevant now as then. Sugar is a poison.

Did you know that on the average we are eating more sugar in a week than our ancestors a couple hundred years ago did in a year? And it's doing a job on us. Sugar is as addictive, and as poisonous, as nicotine.

Tests with school children have shown that a can of soda pop (10 teaspoons of sugar) results in behavior problems. Schools that have eliminated sugar from their lunches have produced remarkable gains in grades, with much less fighting and destructiveness.

## Our Schools Suck

Okay, okay, I've been harp-

ing on this for a long time — so what have you, personally, done to help change things? Did you take your eyes off the sports pages long enough to read about the recent international tests where American kids placed just about dead last in math and science? And we used to be at the top. Or about the tests Massachusetts gave their prospective teachers? Almost 60% failed the admittedly very elementary test!

I won't bore you with the statistics, but they are appalling.

The top scoring countries in math are, as you might expect, the Asian tigers — Singapore, Korea, Japan, and Hong Kong. The Czech Republic placed third in science.

We have a long way to go if we want to fix the problem. Under the "leadership" of the NEA union our ed schools are awful. I tried to get you to read about them when I reviewed Rita Kramer's book, *Ed School Follies*. See page 8 of my *Secret Guide to Wisdom*. Thomas Sowell exposes the mess in his *Inside American Education*. You undoubtedly saved \$10 by not sending for *Dumbing Us Down* by John Gatto. I've reprinted three fascinating talks by Gatto which are available via the Radio Bookshop for \$5. I've been getting wonderful letters from parents thanking me for making these reprints available.

I'd like to see the NEA towed out to sea and dumped, along with the other garbage. I'd like to see our schools operating 50 weeks of the year, with youngsters allowed to take the subjects that interest them when they want. I'd like to see the responsibility for learning put on the students and their parents, but with our schools making the courses available. No tests. No grades. Learn what you want, when you want. I'd like to see courses advertised and promoted like any other product, and the students convinced to take them on the basis of the

Continued on page 57

## World's Smallest TV Transmitters

We call them the 'Cubes'... Perfect video transmission from a transmitter you can hide under a quarter and only as thick as a stack of four pennies - that's a nickel in the picture! Transmits color & B&W with fantastic quality - almost like a direct wired connection to any TV tuned to cable channel 59. Crystal controlled for no frequency drift with performance that equals law enforcement models that cost hundreds more!



Basic 20 mW model transmits up to 300' while the high power 100 mW unit goes up to 1/4 mile. Audio units include sound using a sensitive built-in mike that will hear a whisper 15 feet away! Units run on 9 volts and hook-up to most any CCD camera. Any of our cameras have been tested to mate perfectly with our Cubes and work great. Fully assembled - just hook-up power and you're on the air!

- C-2000, Basic Video Transmitter Cube..... \$89.95
- C-3000, Basic Video & Audio Transmitter Cube..... \$149.95
- C-2001, High Power Video Transmitter Cube..... \$179.95
- C-3001, High Power Video & Audio Transmitter Cube..... \$229.95

## Super Pro FM Stereo Transmitter

Professional synthesized FM Stereo station in easy to use, handsome cabinet. Most radio stations require a whole equipment rack to hold all the features we've packed into the FM-100. Set freq with Up/Down buttons, big LED display. Input low pass filter gives great sound (no more squeals or swishing from cheap CD inputs!) Limiters for max 'punch' in audio - without over mod, LED meters to easily set audio levels, built-in mixer with mike, line level inputs. Churches, drive-ins, schools, colleges find the FM-100 the answer to their transmitting needs, you will too. Great features, great price! Kit includes cabinet, whip antenna, 120 VAC supply. We also offer a high power export version of the FM-100 that's fully assembled with one watt of RF power, for miles of program coverage. The export version can only be shipped outside the USA, or within the US if accompanied by a signed statement that the unit will be exported.



FM-100, Pro FM Stereo Transmitter Kit..... \$249.95  
FM-100WT, Fully Wired High Power FM-100..... \$399.95

## RAMSEY

### Binocular Special

Wow, did we nab a deal on these first rate binoculars! Absolutely identical to a famous big name brand here in Rochester, NY - but without 'their' name. Well made with fully coated optics, super nice rubber armored housing over hi-alloy aluminum, includes lens cleaner cloth, neck lanyard and carry case. 4 styles: roof prism 10x25 (10 power, 25 mm), 10x25 high performance roof prism ruby coated objective lens model for demanding use in bright sun, 10x25 high-end BAK-4 lens porro prism ruby coat with Tac-Grip housing, and Ultra-View 10x50 porro prism ruby coats. First quality, yet at a close-out price on the exact same units as the 'Trademarked' units - but at half price!



- BNO-M, 8x21 Mini Monocular..... \$14.95
- BNO-1, 10x25 Roof Prism Binoculars..... \$24.95
- BNO-1EX, 10x25 Ruby Coated Porro Prism..... \$29.95
- BNO-2, 10x25 TacGrip Ruby Coat Porro Prism..... \$59.95
- BNO-6, 10x50 Ultra-View Ruby Coat Porro Prism..... \$69.95

## CCD Video Cameras

Top quality Japanese Class 'A' CCD array, over 440 line line resolution, not the off-spec arrays that are found on many other cameras. Don't be fooled by the cheap CMOS single chip cameras which have 1/2 the resolution, 1/4 the light sensitivity and draw over twice the current! The black & white models are also super IR (Infrared) sensitive. Add our invisible to the eye, IR-1 illuminator kit to see in the dark! Color camera has Auto gain, white balance, Back Light Compensation and DSP! Available with Wide-angle (80°) or super slim Pin-hole style lens. Run on 9 VDC, standard 1 volt p-p video. Use our transmitters for wireless transmission to TV set, or add our IB-1 Interface board kit for audio sound pick-up and super easy direct wire hook-up to any Video monitor, VCR or TV with A/V input. Fully assembled, with pre-wired connector.

- CCDWA-2, B&W CCD Camera, wide-angle lens..... \$69.95
- CCDPH-2, B&W CCD Camera, slim fit pin-hole lens..... \$69.95
- CCDC-1, Color CCD Camera, wide-angle lens..... \$129.95
- IR-1, IR Illuminator Kit for B&W cameras..... \$24.95
- IB-1, Interface Board Kit..... \$14.95

## Mini Radio Receivers

Imagine the fun of tuning into aircraft a hundred miles away, the local police/fire department, ham operators, or how about Radio Moscow or the BBC in London? Now imagine doing this on a little radio you built yourself - in just an evening! These popular little receivers are the nuts for catching all the action on the local ham, aircraft, standard FM broadcast radio, shortwave or WWV National Time Standard radio bands. Pick the receiver of your choice, each easy to build, sensitive receiver has plenty of crystal clear audio to drive any speaker or earphone. Easy one evening assembly, run on 9 volt battery, all have squelch except for shortwave and FM broadcast which has handy SCA output. Add our snazzy matching case and knob set for that smart finished look.



- AR-1, Airband 108-136 MHz Kit..... \$29.95
- HFRC-1, WWV 10 MHz (crystal controlled) Kit..... \$34.95
- FR-1, FM Broadcast Band 88-108 MHz Kit..... \$24.95
- FR-6, 6 Meter FM Ham Band Kit..... \$34.95
- FR-10, 10 Meter FM Ham Band Kit..... \$34.95
- FR-146, 2 Meter FM Ham Band Kit..... \$34.95
- FR-220, 220 MHz FM Ham Band Kit..... \$34.95
- SR-1, Shortwave 4-11 MHz Band Kit..... \$29.95
- Matching Case Set (specify for which kit)..... \$14.95

## Tiny FM Transmitters



Gosh, these babies are tiny - that's a quarter in the picture! Choose the unit that's best for you. FM-5 is the smallest tunable FM transmitter in the world, picks up a whisper 10' away and transmits up to 300'. Runs on tiny included watch battery, uses SMT parts. FM-4 is larger, more powerful, runs on 5-12 volts, goes up to a mile. FM4-5 operate in standard FM band 88-108 MHz. FM-6 is crystal controlled in 2 meter ham band, 146.535 MHz, easily picked up on scanner or 2 meter rig, runs on 2 included watch batteries. SMT (surface mount) kits include extra parts in case you sneeze & loose a part!

- FM-4MC, High Power FM Transmitter Kit..... \$17.95
- FM-5, World's Smallest FM Transmitter Kit..... \$19.95
- FM-6, Crystal Controlled 2M FM Transmitter Kit..... \$39.95
- FM-6, Fully Wired & Tested 2M FM Transmitter..... \$69.95

## FM Stereo Radio Transmitters

No drift, microprocessor synthesized! Excellent audio quality, connect to CD player, tape deck or mike mixer and you're on-the-air. Strappable for high or low power! Runs on 12 VDC or 120 VAC. Kit includes case, whip antenna, 120 VAC power adapter - easy one evening assembly.



FM-25, Synthesized FM Stereo Transmitter Kit..... \$129.95

Lower cost alternative to our high performance transmitters. Great value, tunable over FM band, plenty of power and manual goes into great detail about antennas, range and FCC rules. Handy kit for sending music thru house and yard, ideal for school projects too - you'll be amazed at the exceptional audio quality! Runs on 9V battery or power from 5 to 15 VDC. Add our matching case and whip antenna set for a nice 'pro' look.

- FM-10A, Tunable FM Stereo Transmitter Kit..... \$34.95
- CFM, Matching Case and Antenna Set..... \$14.95
- FMAC, 12 Volt DC Wall Plug Adapter..... \$9.95

## RF Power Booster

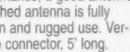
Add muscle to your signal, boost power up to 1 watt over a freq range of 100 KHz to over 1000 MHz! Use as a lab amp for signal generators, plus many foreign users employ the LPA-1 to boost the power of their FM transmitters, providing radio service through an entire town. Runs on 12 VDC. For a neat finished look, add the nice matching case set.



- LPA-1, Power Booster Amplifier Kit..... \$39.95
- CLPA, Matching Case Set for LPA-1 Kit..... \$14.95
- LPA-1WT, Fully Wired LPA-1 with Case..... \$99.95

## FM Station Broadcast Antenna

For maximum performance, a good antenna is needed. Properly tuned and matched antenna is fully PVC enclosed for weather protection and rugged use. Vertical or horizontal mounting. 'F' style connector, 5' long.



- TM-100, Tru-Match FM Station Antenna Kit..... \$39.95

## AM Radio Transmitter

Operates in standard AM broadcast band, set to clear channel in your area. AM-25 'pro' version is synthesized for stable, no-drift frequency and is settable for high power output where regulations allow, typical range of 1-2 miles. Entry-level AM-1 has tunable transmit oscillator, runs FCC maximum 100 mW power, expected range 1/4 mile. Both accept line-level inputs from tape decks, CD players or mike mixers, run on 12 volts DC. Pro AM-25 includes AC power adapter, matching case and bottom loaded wire antenna. Entry-level AM-1 includes an available matching case and knob set for a finished, professional look. High level modulation for low distortion.



- AM-25, Professional AM Transmitter Kit..... \$129.95
- AM-1, Entry level AM Radio Transmitter Kit..... \$29.95
- CAM, Matching Case Set for AM-1..... \$14.95

## World's Smallest FM Radios

Everyone who sees one of these babies says they just gotta have one! Super cute tiny FM radios have automatic scan/search tuning, comfortable ear bud earphones and we even include the battery. The pager style unit looks like a shrunken pager and even has an LCD clock built-in. You will be amazed at the crystal clear amazing sound! That's a quarter in the picture for size comparison - pretty tiny, huh?



- MFMT-1, World's Smallest FM Radio..... \$11.95
- PFMR-1, Pager Style LCD Clock & FM Radio..... \$12.95

## Speech Descrambler

Decode all that gibberish! This is the popular descrambler / scrambler that you've read about in all the Scanner and Electronic magazines. Speech inversion technology is used, which is compatible with most cordless phones and many police department systems.



hook it up to your scanner speaker terminals and you're in business. Easily configured for any use: mike, line level and speaker output/inputs are provided. Also communicate in total privacy over telephone or radio, full duplex operation - scramble and unscramble at the same time. Easy to build, all complex circuitry contained in new custom ASIC chip for clear, clean audio. Runs on 9 to 15VDC. Our matching case set adds a professional look to your kit.

- SS-70A, Speech Descrambler/Scrambler Kit..... \$39.95
- SSS, Custom Matching Case and Knob Set..... \$14.95
- SS-70AWT, Fully Wired SS-70A with Case..... \$79.95
- AC12-5, 12 Volt DC Wall Plug Adapter..... \$9.95

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# LETTERS

Number 6 on your Feedback card

## From the Ham Shack

**Hank Landsberg WB6MEU, Sierra Madre CA.** Regarding the news item that appeared on page 6 of your February issue, please be advised that the information in this item, as it relates to me, is incorrect and outdated. Contrary to the article: (1) I was NOT arrested; (2) I was NOT cited; and (3) even according to an FCC spokesperson, my amateur license was NOT "in jeopardy." This matter has been resolved, and my Advanced Class ticket is intact.

*Our apologies to Hank. As we noted at the time, the item in question originally appeared in The ARRL Letter. — ed.*

**Dean E. Hale KF7CR, Eugene OR.** On a return trip from India, I transited through San Francisco airport. In the North Terminal Connector Gallery (mostly United flights), there is a display (called "On the Air") of radios from the '20s through '60s. There is also a display of microphones and some examples of broadcast band receivers of notable aesthetic design or function. It is a great place to spend an hour or two. Actually, I was frustrated that I had a layover insufficient to see everything.

I ran into a retired nun who saw one of the old radios from the '40s. She confessed to me that when she was a child, she used the light from the back of a tube radio to read by after it was time for lights out.

The exhibit runs through July 1999. It's well worth the visit!

*Thanks for taking the time to share, Dean ... — ed.*

**Jules E. Blitz W3YZE, Baltimore MD.** I really enjoyed Bob Shrader's article on "Keys to Good Code" (March). May I add my two cents?

As a regimental radio opera-

tor in the infantry in Europe in WWII, and eventually radio chief, I spent many hundreds of hours at the code table in Camp Wheeler, Georgia, and then at an advanced radio and code course at Fort Benning. We were taught that the sending was really done with the wrist (as the article clearly points out) and we had to practice holding the key knob in our right hand and pushing the wrist with the left so we would get the feel of it. Strangely enough, it can be done. Eventually, I passed 20 words per minute and I still proudly have my certificate to prove it. But the next step, 25 WPM, eluded me. I could copy behind as you had to do, but the army insisted that every letter be printed the GI way, and I never could get my printing fast enough for 25.

There were two sets of rhythm practice (having nothing to do with birth control — the saltpeter in the coffee took care of that). We would send BENNING and B7FG4. It helped to get the rhythm of code down, almost like music.

The idea behind the sending was for everyone to have the same fist so the Germans wouldn't be able to tell which unit was sending. Of course, in very little time we always knew who was on the key at the other end, be it the drag on the dah on Roger or six dits when all he needed was five.

And then, after all that wonderful code table practice and using the wrist to send, when we got into the field in combat conditions, guess what? Right. We used a leg key clamped onto the thigh and never did anything more than slap it to send messages. Try sitting in a crowded jeep and sending with your wrist using a leg key ... forget it.

I have been a ham now for 45 years and still enjoy CW. It's

like having a second language and being able to communicate with those special people who also know this fast disappearing language. Interestingly enough, most of the punctuation remains the same. Our question mark was INT and his end of QSO as SK was always VA to us, which comes out of the same end of the horn.

So to all and any potential CW ops out there, re-read that article. It is full of good practical advice. DIT DAH DIT DAH DIT — DAH DIT DAH ...

**Alan Glasser NY2G, Brooklyn NY.** The consumer magazines' advertisement headlines read, and the television shopping shows say, "You can talk in the mall, on the slope, on the trail, and across the park." "Family and friends stay together even when they're apart." "Talk from car to car." "While riding your bike." "No cell phone fees." "Free!" "Up to 2 miles' range." "14 channels and 38 privacy codes." "Reach out and touch someone."

If you haven't figured it out yet, I am quoting from advertisements touting the benefits of the small hand-held two-way radios that are used in the Family Radio Service (FRS). The Family Radio Service is a license-free, short range, low power, two-way radio service that was established by the FCC back in 1996 specifically for family and individual recreational use. These radios operate on a 14-channel frequency range from Channel 1 being 462.5625 MHz to Channel 14 being 467.7125 MHz (specifications from my Motorola Talkabout).

Most of the radios have "Interference Eliminator Codes," Continuous Tone-Coded Squelch System (CTCSS as we hams know it), or Private Line (PL™ as Motorola might have you know it).

Many of the radios have advanced features such as hands-free VOX, headsets, recharging accessories, and carrying acces-

sories. Enough to make me jealous of what's available for my HTs.

I know you've seen them. I have seen them in the malls, and while skiing and hiking. I've even seen a family outfitted using a yellow set of them while I was standing on line at Kennedy Airport. (*And many families don't go to Disney without them ... — ed.*)

I've been a ham since 1984. My first HT was an ICOM IC-02AT. I've had a few other HTs since then. But you know what? I went out and purchased a set of these FRS radios for use with my friends when hiking or traveling in separate cars. I take them to the mall. I use them when I bike with a friend.

Let me make something perfectly clear: I always have a dual-band HT with me. But, since my companions may not be hams, I keep a set of FRS radios in the trunk of my car. They are convenient, cost-effective, rugged, work well, and meet the need. They work "up to 2 miles" on a good day.

So what are we missing here?

The public (non-ham community) has become radio-active. They are buying and using these things! They are getting used to pressing a Push-To-Talk button and communicating with someone else. On an HT! On UHF! Using CTCSS! With about the same power many ham HTs put out!

*But they can only talk up to 2 miles on a good day!* The FRS does not allow the use of auxiliary antennas (the units' antennas are fixed), or the use of repeaters.

What kind of excitement do you think could be generated if the public were educated to the fact that instead of being limited to 2 miles, they could communicate 20,000,000+ miles?

Now, before I get a zillion letters questioning how a UHF HT can communicate twenty million miles, I did a very quick estimation of all the listed re-

*Continued on page 62*

# MFJ TUNERS

## MFJ-989C Legal Limit Antenna Tuner

*MFJ uses super heavy duty components to make the world's finest legal limit tuner*

MFJ uses super heavy duty components -- roller inductor, variable capacitors, antenna switch and balun -- to build the world's most popular high power antenna tuner.

The rugged world famous MFJ-989C handles 3 KW PEP SSB amplifier input power (1500 Watts PEP SSB output power). Covers 1.8 to 30 MHz, including MARS and WARC bands.

MFJ's AirCore™ roller inductor, new gear-driven turns counter and weighted spinner knob gives you exact inductance control for absolute minimum SWR.

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips,

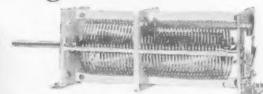


shortwave -- nearly any antenna. Use coax, random wire or balanced lines.

You get everything you've ever wanted in a high power, full featured antenna tuner -- widest matching range, lighted Cross-

Needle SWR/Wattmeter, massive transmitting variable capacitors, ceramic antenna switch, built-in dummy load, TrueCurrent™ Balun, scratch-proof Lexan front panel -- all in a sleek compact cabinet (10 7/8" W x 4 1/2" H x 15 D in).

MFJ-989C  
**\$359<sup>95</sup>**



MFJ AirCore™ Roller Inductor gives high-Q, low loss, high efficiency and high power handling.

MFJ's exclusive Self-Resonance Killer™ keeps damaging self-resonances away from your operating frequency.

Large, self-cleaning wiping contact gives good low-resistance connection. Solid 1/4 inch brass shaft, self-align bearings give smooth non-binding rotation.

MFJ No Matter What™ Warranty

MFJ will repair or replace your MFJ-989C (at our option) no matter what for one year.

## More hams use MFJ tuners than all other tuners in the world!

### MFJ-986 Two knob Differential-T™



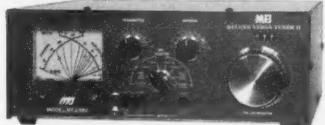
Two knob tuning (differential capacitor and AirCore™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. 10 1/2" W x 4 1/2" H x 15 in.

**MFJ-986D compact Tuner for Amps**



A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-81H! AirCore™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. 10 1/2" x 4 1/2" x 10 1/2" in.

**MFJ-969 300W Roller Inductor Tuner**



Superb AirCore™ Roller Inductor tuning. Covers 6 Meters thru 160 Meters! 300 Watts PEP SSB. Active true peak reading lighted Cross-Needle SWR Wattmeter, QRM-Free PreTune™, antenna switch, dummy load, 4:1 balun, Lexan front panel. 3 1/2" H x 10 1/2" W x 9 1/2" D inches.

MFJ-986  
**\$329<sup>95</sup>**

MFJ-962D  
**\$269<sup>95</sup>**

MFJ-969  
**\$189<sup>95</sup>**

### MFJ-949E deluxe 300 Watt Tuner

More hams use MFJ-949s than any other antenna tuner in the world! Handles 300 Watts. Full 1.8 to 30 MHz coverage, 48 position Precision48™ inductor, 1000 Volt tuning capacitors, full size peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, QRM-Free PreTune™, scratch proof Lexan front panel. 3 1/2" H x 10 1/2" W x 7 D inches. MFJ-948, \$129.95. Economy version of MFJ-949E, less dummy load, Lexan front panel.

**MFJ-941E super value Tuner**

The most for your money!

Handles 300 Watts PEP, covers 1.8-30 MHz, lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek 10 1/2" W x 2 1/2" H x 7 D in.

**MFJ-945E HF+6 Meter mobile Tuner**

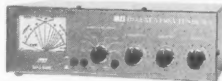
Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. Lighted Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz and 6 Meters. 300 Watts PEP. MFJ-20, \$4.95, mobile mount.

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## Ham Radio Numbers Declining

The numbers for 1998 are in, the trend is downward and the outlook is not very good for the future of amateur radio. This is the gist of recently released FCC figures on the number of amateur radio operators licensed by the agency, and if the figures hold, 1998 will have been the first year of actual decline in the total number of United States radio amateurs in the past two decades.

A year ago, there was a total of 719,331 licensed radio amateurs listed in the FCC's database. Twelve months later, that figure has dropped to 718,241. That's a drop of 1090 hams, or a 0.2% annual rate of attrition, and while it might not seem very significant, 1090 is more hams lost in the United States than are licensed in some other nations.

Looking at the percentage rates gives even more reason for alarm. Since 1992, when the annual growth rate was a healthy 8.4% a year, the trend has been steadily downward. In 1993, it had dropped to 7.3%. By 1994, to 6.7%. 1996 had the most dramatic drop, to a minuscule 0.8% growth, and now, in 1999, we are into negative numbers.

And negative numbers mean that the ham radio bands are more vulnerable to attack from the corporate raiders in the telecommunications industry. These are people who envision millions of dollars of profit by evicting hams from the bands above 50 MHz, and having that valuable spectrum reallocated to their use.

It also means that the government itself might begin to think in terms of the millions or billions of dollars that it might garner by auctioning off some of our bands. Finally, on another level it means that there will be less interest by companies in introducing new equipment. As any manufacturer will tell you, it makes no sense to put money into research for new products for a market that may soon die off.

Thnx to *W5YI Report*, reprinted in *The Cherry Juice*, newsletter of the Cherryland (Traverse City MI) ARC, February 1999.

## ARRL License Restructure Reply Filed

The ARRL has suggested that its plan to restructure amateur radio licensing represents the best compromise among the many that have been brought forth. In reply comments filed January 15 with the FCC, the League held firm to its

restructuring proposals that would reduce the number of license classes from six to four by eliminating the Novice and Tech Plus tickets; provide 5 WPM and 12 WPM Morse code testing tiers; and permit Technician operators to use Morse code on the current General Class CW bands.

The League's plan would also reform the Novice/Tech Plus CW allocations among the remaining license classes and revise both written and Morse exam requirements to make them more relevant and more comprehensive. In general the League's reply comments reiterated its initial comments filed last December 1.

The ARRL said four license classes provided a manageable gap between license classes to encourage upgrading. "Looking at the matter this way, four license classes is a good plan, and three license classes is not," the League said. Under its plan, Novice and Tech Plus licensees would be automatically upgraded to General.

The League found an ally in CQ Communications comments on reforming the Novice/Tech Plus CW allocations among the remaining classes for additional phone bands. CQ called it "the correct approach."

Thnx to the ARRL Letter, courtesy of Peoria Area ARC's March 1999 *Bandbits*.

## FCC Mission?

A top federal legislator has called for the FCC to get out of the regulatory business and to concentrate on making money for the federal government.

Louisiana Republican Billy Tauzin says that the FCC needs to be revamped to have a competitive rather than regulatory mission. Tauzin is the chairman of the House Committee on Telecommunications. On Friday, March 12th, he told reporters that he hopes to have a bill drafted by this month detailing the changes in the FCC's mission and structure that Congress would like to see implemented.

Tauzin says that he doesn't have many specifics and is open to suggestions. He and other Republicans in Congress have criticized the FCC for acting too regulatorily. This is particularly true in areas such as the implementation of a 1996 law freeing cable, local and long-distance companies to get into each other's business.

Meanwhile, FCC Chairman Bill Kennard says that he is very interested in working with congressional lawmakers to help the agency run effectively into the 21st century. Kennard says that he will present an upcoming congressional telecommunications hearing with a blueprint for restructuring the agency that would be open to public comment. He says that by the fall he would like to have a final plan in place.

What impact such a restructuring might have on amateur radio is hard to say, but it would definitely make any spectrum above 50 MHz—and possibly some in the shortwave region—more vulnerable to reallocation and auction. This may well be the main reason that the ARRL is pressing so hard for the passage of its Amateur Radio Spectrum Protection Act. This, as a way of ensuring that hams have a place to operate no matter what happens to the mission and the structure of the FCC.

FCC Chairman Kennard prefers a two-tiered approach to restructuring the Commission. He says that part of the plan could be implemented by the FCC itself, but requires congressional action first. It's not clear that any measure to overhaul the FCC could pass Congress and be signed into law.

Meanwhile, Kennard has taken on another challenge, that of convincing the public that his agency is not about to begin regulating the Internet.

The Federal Communications Commission was bombarded with E-mail from computer users fearing government regulation. On Thursday, March 11th, Kennard tried to dispel that notion, stating that as long as he is chairman, the Federal Communications Commission will not regulate the Internet.

The FCC last month concluded that dial-up calls to the Internet are interstate communications and are subject to federal jurisdiction. Internet dial-up connections are now treated as local calls. The FCC has said this decision merely resolves a dispute among phone companies over how to compensate each other for Internet connections and how to clarify the role of state and federal regulators. The agency said the decision will not affect connectors to the Internet or how much they are charged for the call.

Consumer groups and others believe that the action could lead to higher Internet access charges in the future, but Kennard says that the FCC has no intention of making computer users pay long-distance fees for dial-up access.

Thnx to the FCC and to *Newsline*, Bill Pasternak WA6ITF, editor.

## New Technology for the Amateur Bands

Many amateurs are concerned about the future of our hobby. I think that lack of interest on the part of persons who would otherwise become licensed is the basis of this concern. Two major reasons for this uninterest, in my opinion, are the lack of time and energy. Together with the stigma of ancient technology, these provide a sufficiently high-energy barrier to the learning of code.

The Internet, perceived as a modern technology, provides a means to satisfy the urge to communicate and makes it easy to reach across the globe.

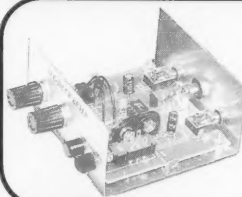
I feel that new technology is required to attract more people to our hobby. A new, digital,

*Continued on page 38*



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# Regens for the Millennium

*Part 1: A new look at an old friend.*

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Sherman IL 62684

**T**hey come and go, these strange little devices. Every few years sees a resurgence of interest in a simple concept known as the regenerative receiver. If you have ever played with one you know they produce a unique kind of fun. If you have never done so, you are in for a treat. In this first of a two-part series, we'll look at the construction side of these receivers,

where to obtain parts, how to build them, and how to make improvements. Next time, we'll dig a little deeper into the frequency selection side of things and examine custom-built coils for extended spectrum coverage.

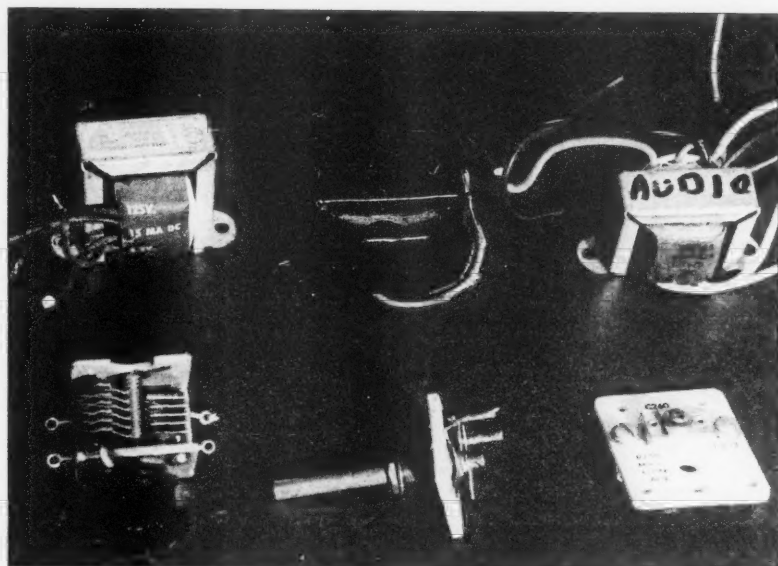
The regenerative receiver is perhaps the easiest path to amateur and short-wave radio reception short of a crystal set or TRF receiver, the only less-

complicated devices known. Regens are very easy to build and require no alignment. When you finish construction, you power them up and they work—nicely. They do take some getting used to, though. Typically, they perform at their peak for some four or five hours after sunset. Daytime reception is nearly impossible. And tuning one requires a fine balance of several controls, which takes some operating experience to develop. Once set, a regen will provide many hours of simple enjoyment.

During the past 60 years, thousands of hams and SWLs have gotten their start with one of these units. By the early 1960s, the circuit had gone through an evolution that culminated in such classic commercial rigs as Allied Radio's "Ocean Hopper," "Space Spanner," and "Span Master," each successively a bit more sophisticated. Companies such as Lafayette Radio offered their competitive "Explore-Aire," as did many other copy-cat firms. Today, these units are scarce, but work-alike units can be easily replicated, even to the point of improvements the original designers never considered. Designs from previous decades were covered in an excellent



**Photo A.** These boat anchors will be your flea-market source for parts such as those in **Photo B.**



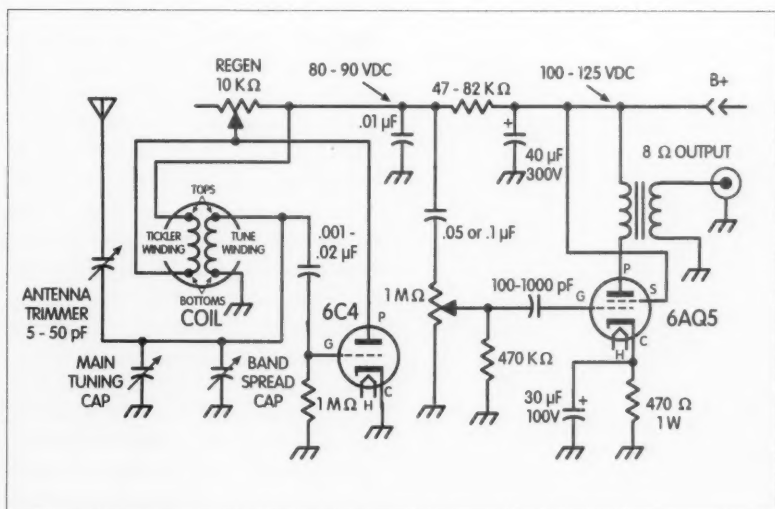
**Photo B.** Mined from the past (clockwise from top left): power transformer, choke, audio transformer, antenna trimmer, bandspread selector, main tuner.

article printed in the Fall 1995 issue of *Communications Quarterly* magazine.

Though many solid-state versions continue to be developed, the best overall success can be found with simple tube-type circuitry. Reason: The tubes match impedances of the long-wire antenna and home-brew coils more readily than do 2N2222s or FETs. Also, tubes of the types needed are plentiful and nearly as cheap as transistors. Many of the parts required for a tube rig are sitting around just waiting for a taker, often even for free.

A little history will be helpful here. Back in the "tube days," commercial regenerative receivers were usually built as cheaply as possible. Their so-called power supplies were a joke, and very dangerous. Often, a high-impedance, 2000  $\Omega$  headphone was all they would power. No one ever dreamed of feeding them to an outboard amplifier or tape recorder, and you didn't dare ground them!

In those days, regens often consisted of two tubes: a regenerative detector (12AT6) and an audio amplifier

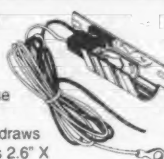


**Fig. 1.** Basic regenerative receiver concept.

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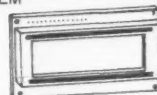
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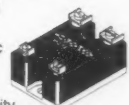
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	Cathode	Grid	Plate	Heater
6C4	7	6	5	3, 4
1/2 6AW8	1	2	3	4, 5
1/2 12AT7	3	2	1	4, 5, 9
1/2 12AT7	8	7	6	4, 5, 9
6C5 Octal*	8	5	3	2, 7
6AT6 (ground pins 5&6)	2	1	7	3, 4

\*Older-style tube

Table 1. Detector/added audio.

	Cathode	Grid	Screen	Plate	Heater
6AQ5	2	1	6	5	3, 4
1/2 6AW8	6	7	8	9	4, 5
6V6*	8	5	4	3	2, 7

\*6F6, 6K6, 12A6 may also be tried

Table 2. Audio output.

(50C5). A third "tube" was a 35W4 power rectifier, which did nothing for reception. Back then, all the tube filaments were strung together in series and powered directly by the 110 VAC house current. That same house current was rectified into the B+ DC by the 35W4. This is what made the regen

dangerous to ground. The manufacturers recommended using an isolation transformer, but that was not usually done.

Today we can improve things greatly, and even though the design itself is decades old, these units still perform very well considering their low

cost and simplicity. We begin by looking at hamfests, flea markets, thrift shops and garage sales for the parts we need. You won't just walk into Radio Shack™ and buy them. The good news, of course, is that you probably won't have to look very far, or pay very much.

First, try to locate an old "five-tube" table radio, which will contain most of the parts you'll need. The five tubes were as follows: 35W4, 50C5, 12AV6, 12BA6, and 12BE6. Because we are interested in upgrading the regen design, you won't be using any of the tubes, but the tube sockets, tuning capacitor, and many of the components will provide a great start toward your home-brew receiver. Other similar devices such as intercom or PA units, phono oscillators, or CB transceivers that date from about forty years ago will provide most of the audio stage components.

Our regenerative detector stage will be simplified, because in those days a few of the unused tube pins were grounded. Here we will use simple tubes that do not contain extra elements. The socket and a few salvaged resistors are all we'll require. The power supply will call for a transformer with a six-volt filament winding and a B+ winding of 125 to 250 volts. Any value is fine, although most transformers will produce about 150 volts. These can be found in old transceivers such as the Heathkit™ "Lunch Boxes," or can be taken from old unwanted test equipment such as capacitor checkers, VTVMs, or signal generators. At any given hamfest, there are tons of this stuff available, often priced at five dollars or less, usually much less. This is what you want. One of these units should also provide a suitable chassis (and cabinet) for your receiver. After sifting through four or five hamfests (at most), you should have all the parts you'll need to proceed. If not, check with other hams to see if they have any still-missing items in their junk boxes.

Since the tubes we will be using have base diagram differences, the circuit will need to be completely rewired. This means the salvaged tube sockets must be completely unsoldered. The

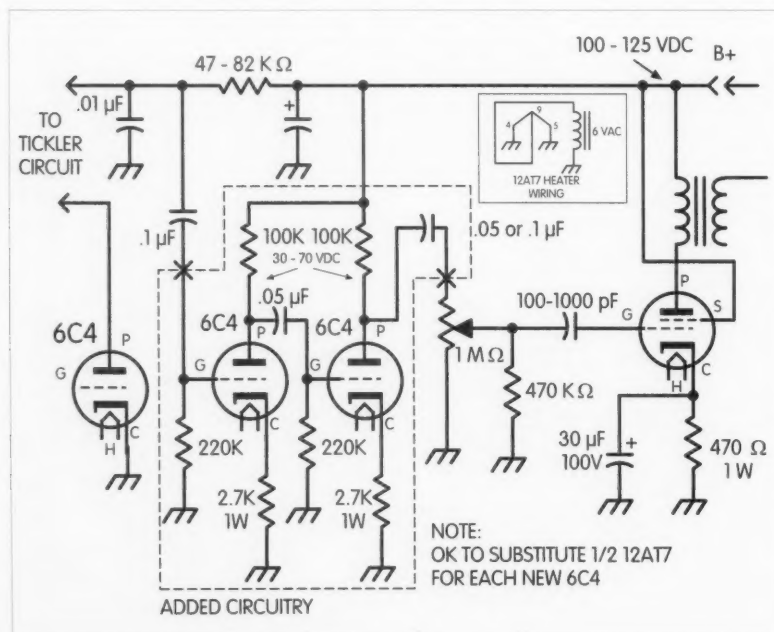


Fig. 2. Modification for more audio drive to power a speaker.

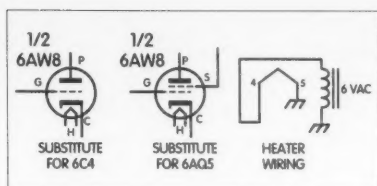


Fig. 3. Modifications needed for a single-tube version.

circuit itself, though, is very forgiving. Parts can be placed where desired and wires do not need to be short. This is a big help if using a prepunched chassis, with existing holes. It also makes it a good beginner's project, *before* you tackle that commercial transceiver kit.

Parts can be located anywhere, though the project should be divided into three separate sections: the regenerative detector stage, the audio stage, and the power supply. For the detector, start with a 6C4 tube and socket. For the audio amplifier, a 6AQ5 works very nicely. These two stages will power an 8  $\Omega$  headset quite well. Later, we'll expand the circuit to allow these same tubes to power a small 4-inch speaker (Fig. 2), then we'll shrink it down to a single tube for a more compact unit, QRP-style (Fig. 3).

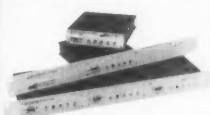
The circuit shown in Fig. 1 holds the basic design. The detector is coupled through a .05 or .1  $\mu$ F capacitor to the audio stage. This junction is important, as we will be breaking it to insert more amplification later. Note that the 6C4 has three connections aside from the filaments: the cathode, the grid, and the plate. Table 1 shows which pins on the socket to wire, as well as the filament pins which light the tube. Also given in Table 1 is data for other tubes that work equally well, but you need to know which tube is available *before* you wire the circuit.

Table 2 gives similar data for the audio stage, and adds the required screen grid. We've already selected the 6AQ5 as our tube of choice, largely because you may have already discovered one in the chassis you salvaged for this project. If not, they are cheap and plentiful nonetheless. The power supply can be done two ways: It can be

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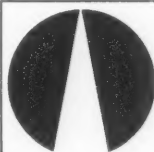
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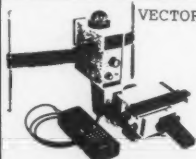
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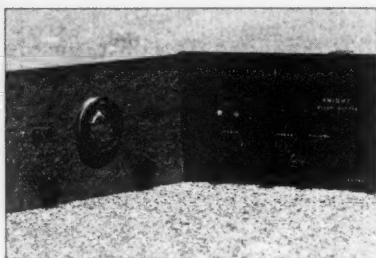


Photo C. A real "Ocean Hopper" (left)  
sits beside one of the author's "replicas."

## Regens for the Millennium

continued from page 13

built onto the same chassis as the receiver, or separated into its own enclosure to power other projects (or other regens) as well.

Fig. 2 suggests a method of expanding your receiver once you have it working. Either a single 6C4 can be used to provide enough extra amplification to drive a small speaker, or two 6C4 stages can be added for even better performance. Now we can make a few new choices. A 12AT7 tube has two 6C4s inside of it. Both can be used for additional audio amplification, or one side can be used as the regenerative detector! This concept gives quite a bit of latitude in decision making. Since both stages are identical, one can be deleted or converted to a detector.

(You can even go so far as to make interchangeable plug-in detector stages on separate plates of aluminum if you like to experiment; the audio stage and power supply remain as they were.)

Fig. 3 takes the original design (Fig. 1) in the other direction: Here we squeeze the entire receiver into just one tube, yet it performs exactly as well as its two-tube predecessor. For this design we use a more advanced tube, the 6AW8, which essentially combines one 6C4 and one 6AQ5 in the same glass enclosure. Oddly enough, this also gives us more choices in expanding our project. We can combine the 6AW8 with either a 6C4 or a 12AT7 for a more substantial receiver on basically the same chassis space. It is useful to note here that the 6C4 and 6AQ5 tubes use seven-pin tube sockets while the 12AT7 and 6AW8 tubes require nine-pin sockets. Available chassis space will largely be the deciding factor, as will your personal expertise. No other component changes are necessary.

Once any of the basic designs has been successfully built and operated, it is easy to continue to refine and experiment. I should mention that the resistor and capacitor values (bias) shown in the design work very well regardless of the tube complement. The

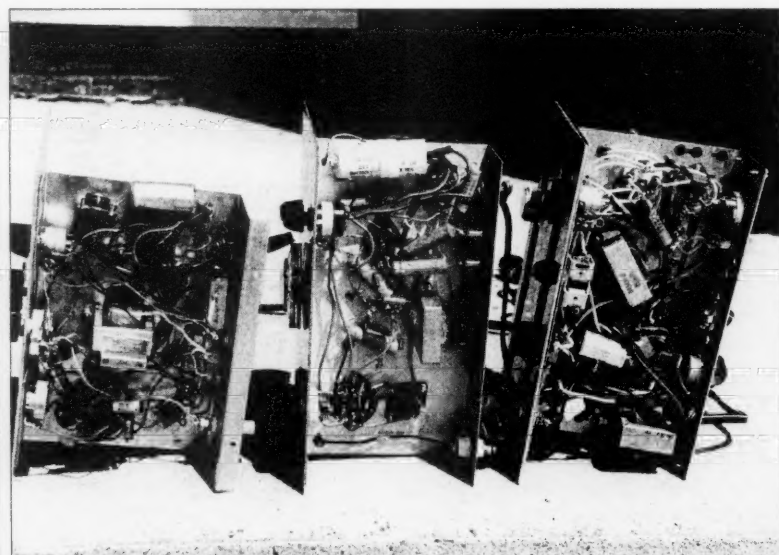


Photo D. Here, a real "Ocean Hopper" is flanked by two workalikes (each containing built-in PS).



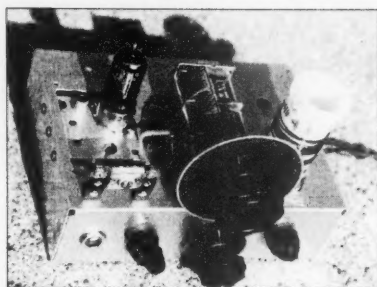


Photo E. The one-tube version is laid out in Fig. 3. No front panel, all parts on the chassis, remote PS!

reader could continue to refine the design with other values, but performance will largely remain unchanged. As I stated, the basic design is very forgiving, so anything goes.

Nor are all the refinements electrical. In expanding upon the author's original Allied Radio "Ocean Hopper" replica design, a number of cosmetic changes were attempted as well. As shown in the photographs, each successive design took on a look of its very own.

Here are some of my recommendations for parts placement:

- Locate the tuning capacitor on the top of the chassis, centered, and with the bandspread capacitor directly below it.

- Locate the coil and regenerative detector tube close to one another, to one side of the tuning capacitors.
- Locate the audio tube and audio transformer as far away as possible from the detector components. If a power supply is to be included on the same chassis, as opposed to a separate unit, divide the chassis roughly into thirds, and give each stage about the same amount of space once the tuning and bandspread capacitors are placed.
- A single-section variable capacitor

can be used for main tuning—this will simplify the design. These capacitors are sometimes found in transmitters, CB sets, or test equipment. If a multi-section capacitor is used, wire only the section with the most plates.

- The antenna trimmer must have both sides isolated from ground, as it is in series with the antenna and the tuning circuit. Use plastic or mount on a terminal strip. Most suitable antenna capacitors require a screwdriver to adjust, as opposed to a knob. This is part of the fun of a regen!

- If plug-in coils are used, never change coils with the power on.

Continued on page 16

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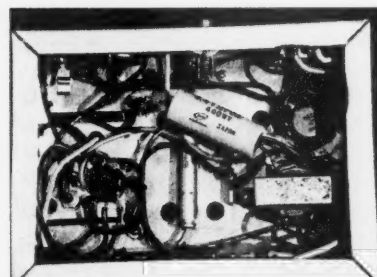


Photo F. Underside of the one-tube.

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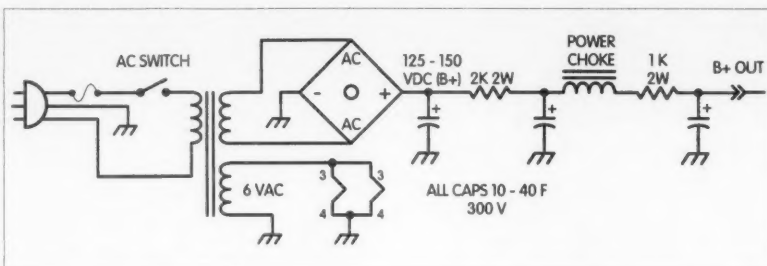


Fig. 4. Power supply circuit.

## Regens for the Millennium

continued from page 15

### Operation

The tuning process is a fine balance between adjustment of the antenna trimmer, the regen pot, and the bandspread controls. The antenna trimmer is a "set and forget" affair. Adjustment is made with a small screwdriver in the versions I made. The antenna trimmer is tuned for max and only needs readjustment if

you change coils or move the main tuning capacitor between opposite ends of its range. The regen control is delicate, and mastery of the regen knob only comes with practice.

Set the main tuning capacitor to a region that seems active and use the bandspread capacitor to fine-tune the signal. Once the controls are balanced, you will enjoy hours of listening. As a bonus, the circuit can even process the stronger CW and SSB signals on the amateur bands. By the way, these receivers occasionally suffer "bad days" of reception, where they seemingly do not work at all. Just a few days later, propagation changes and reception can be nearly "wall to wall" across the dial. Keep that in mind.

Reprints of manuals for the original "Ocean Hopper," "Space Spanner," and "Span Master" radios are available from Hi-Manuals, PO Box 802, Council Bluffs IA 51502. Parts are where you find them. Your first shortwave coil can be wound from #20 wire on a 1-inch or 1-1/4-inch form. Use 4 turns for the tickler winding and 9 or 10 turns for the tune winding. This will place you in approximately the 5-10 MHz portion of the shortwave spectrum. Be sure to wind both coils in the same direction—starting at the bottom of the coil, wind in a clockwise direction as you move upward, as viewed from the top of the coil.

If plug-in coil forms and a socket are available, you can experiment with winding other coils for wider coverage. Next time we will do just that. We will take an in-depth look at the secrets of successful coil-winding, not just for regenerative radios, but for nearly any other project (such as a matching QRP transmitter) you may desire.

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What is being shown here is the ability of the novice, with limited technical expertise, to put together a world-class 9 dB (over a dipole) gain antenna for under \$65. In today's expensive world, this is a real eye opener.

All of the components are readily available from the local hardware or home improvement store. Tools amount to the kind of tools that every home owner must have to maintain his investment—the ranch! These tools are a hack saw, screwdriver, adjustable wrench (or equivalent), and, of course, a drill with a couple of bits. If you want to make things look pretty, then maybe a crosscut file would help. Now, this project is not for the critics to bash or go into a Ph.D. thesis on—it's just common sense construction and tested results. Please, no experts need to criticize: Just go on purchasing those expensive commercial yagis.

This quad has been constructed and sized for 144 MHz and 440 MHz, and has been used for several years at this QTH. It has been modeled and plotted using several two meter repeaters in the area, a couple of which are of the 250 feet above ground and better variety. Signal strength readings were made on a Kenwood TS-780 (144 + 440 MHz) transceiver S-meter. The ten meter version was likewise plotted using a Kenwood TS-430-S transceiver S-meter using both ten meter Caribbean repeaters and European and African DX station signals. On the ten meter quad, these signal strengths (forward/back/side) were compared with an 80 meter dipole broadside in the same direction as reference. Signal strength at times was less than S-1 and unreadable; immediate switch to the ten meter quad resulted in an S-9 strength.

As for the use of circles instead of the classic square or diamond or delta shapes, there are many Ph.D.-type mathematical- and computer-derived reports of comparison with all of these shapes as well as yagi designs. The circle will always outperform these other types on weak DX conditions. That controversy will probably always go on, but my 36 years of military

service as a communicator, plus the 43 years of being licensed as K8IHQ (with a huge number of operating hours on the bands), tend to give me common knowledge beyond the phony smoke and mirrors or political agenda folks. I endorse the circular quad.

If contemplation of extending the number of elements beyond four is rolling around in your mind, experience has taught me that real gain is just not there unless yagi elements are used beyond the four circular elements. One of the side effects of this will be higher noise levels, corona discharge (wind effects), and lowering the usable bandwidth, which is especially important on ten meters (also 2m-70cm). For those who wish to construct one of

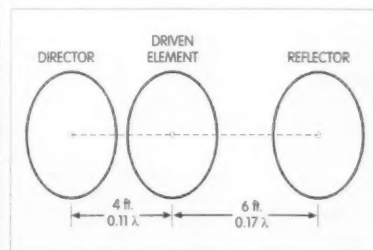


Fig. 1. Spacing diagram for the circular quad.



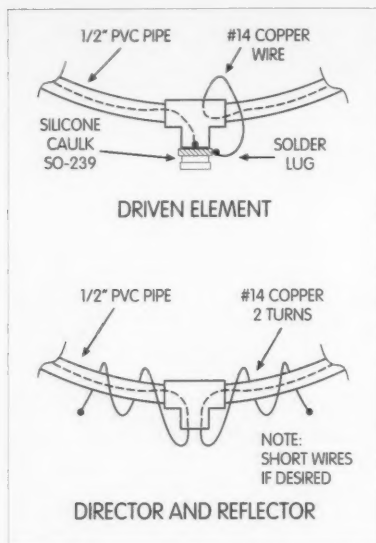


Fig. 2. Tee connections for the driven and parasitic elements.

these for two meters, it might be noted that it will be three wavelengths on 70cm—therefore you get additional gain on 70cm along with the large bandwidth gains.

The objective of this article is to provide detailed instruction on how to purchase components locally, cash-and-carry style, and put together an inexpensive high gain antenna system that does not require tuning, expensive meters, and gadgets to make it work.

Your coax length should be an odd multiple of one-half wavelengths at the lowest frequency you expect to operate. Make sure you include the VF (velocity factor) when figuring this length. Approximately 18 feet is one-half wavelength on 28.4 MHz. Now multiply the VF with this length to get

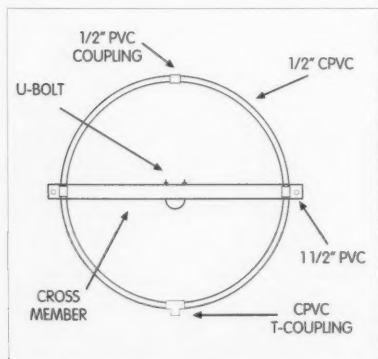


Fig. 3. Element mounting details.

the electrical (not physical) half wave-length at this frequency. Cables such as RG-213, RG-8, RG-58, etc., which have a solid poly internal covering (i.e., between the center conductor and shielded braid), have a VF of about 67%. The other types that have a foam insulation generally have a VF of about 79%. Whether you use 52 ohm or 75 ohm impedance types makes very little difference. In fact, a 75 ohm characteristic impedance more closely matches the circular loop impedance. This is not a critical item. For those few diehard old-timers who insist on minimum loss at 28 MHz and insist on using 300 or 450 ohm twinlead with a 4:1 balun or antenna tuner, you have been around long enough to know how to deal with that type of transmission line.

Once you have determined that the tower is 22 feet tall or higher, then you can determine the physical length of the coax for proper operation (i.e., odd multiple of one-half wavelengths  $\times$  VF at the lowest frequency that the cable is going to be used on—even at 1.8 MHz if you are remotely switching it to a 160 meter system). Also make sure, for propagation and safety reasons, that the shield of the coax is grounded at the base of the tower.

Now we can begin with the construction of the antenna system. The bill of materials shown in **Table 1** will be needed to make a good healthy antenna that has been proven to go through ice, snow, and 80 mph winds safely. The main reason is that it is extremely light in weight and very flexible. The rotor system will also benefit with this type of antenna system. One warning given is that the plastic should not be painted with anything. For an example, should black primer be used, summer sunshine will raise the temperature above the 200° F level and disaster will set in!

The source of a 10-foot boom is any place that sells chain link fence. This is a top rail made to telescope into another, so 20 feet or so of boom is possible. The optional 5-foot mast is in case your present mast does not extend 5 feet above the tower. If you need a mechanical system to connect the mast

to the boom, the use of aluminum plates and stainless U-bolts is recommended. The additional couple of stainless bolts and nuts to secure the boom and mast to the plate for guaranteed non-slip is well worth the two dollars. Climbing towers is not my idea of fun.

Now that we have spent time and money purchasing and bringing home the plumbing and construction components, let's put together a nice looking quad antenna system. It must be noted that the general practice is to install a gamma match system to match the antenna array and coax impedances and to establish a balanced loading condition. I found that on the circular element

Parts List	
Qty.	Description
4	1.5" PVC-DWV drain pipe 10 ft.
3	1.5" PVC-DWV couplings
12	0.5" CPVC water pipe 10 ft.
9	0.5" CPVC water pipe couplings
3	0.5" CPVC water pipe T-couplings
1	1-5/8" galv. steel tubing 10 ft. (fence rail)
110 ft.	#14 or #12 AWG bare copper wire
3	4" x 8" galv. steel perforated plate (decks)
12	#6-1/2 stainless steel sheet metal screws
3	1.5" steel U-bolts, long (PVC-to-boom)
6	#1/4 x 3" galv. steel bolts (end cross member)
12	#1/4 nuts (use on item above, double nut)
1 can ea.	PVC cleaner, PVC/CPVC glue
Optional	
1	10" x 10" aluminum plate (0.25" thick)
2	1.5" galv. steel U-bolts (short)
2	2" galv. steel U-bolts (short)
2	#1/4 x 2" galv. steel bolts/nuts
1	1-7/8" x 5 ft. galv. steel mast (fence pole)

Table 1. Parts list.

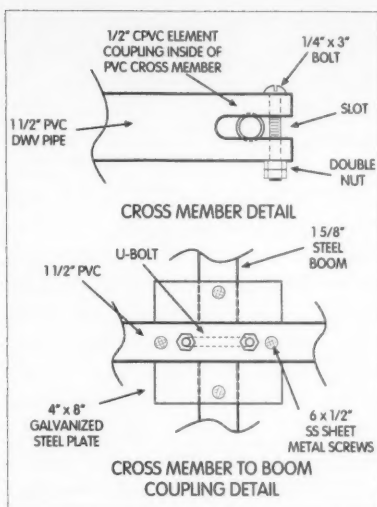


Fig. 4. Cross member and boom mounting details.

quads in particular, the driven element must be broken at the feedpoint to get it to comply with standard gamma match systems. After putting on the gamma match, a good match was accomplished. However, for unknown reasons the received signal was diminished considerably with the use of AC coupling vs. DC coupling (no gamma). So for simplicity and performance sake, a direct coupling unbalanced termination was made that resulted in excellent performance. Do what works!

First, make the driven element. It is being cut for approximately 28.4 MHz center. This results in about 35 feet of total length. Take four of the CPVC pipes and cut off the ends to achieve a length of 8 feet 9 inches, which equals a circumference of 35 feet. Cut a 36-foot length of copper wire and begin inserting into the end of the first section of pipe. When it reaches the end, clean the surface of the CPVC pipe and a coupling. Then apply glue and couple. Ensure that these pipes are lying on a relatively flat surface. Continue to insert the copper wire one section at a time. When all four sections are put together, use a T-coupling CPVC to complete the loop, ensuring that the ends of the copper wire are drawn through the holes in the T-coupling. See the drawing. Now insert an SO-239 or N coax receptacle. This is done with one copper wire to a solder

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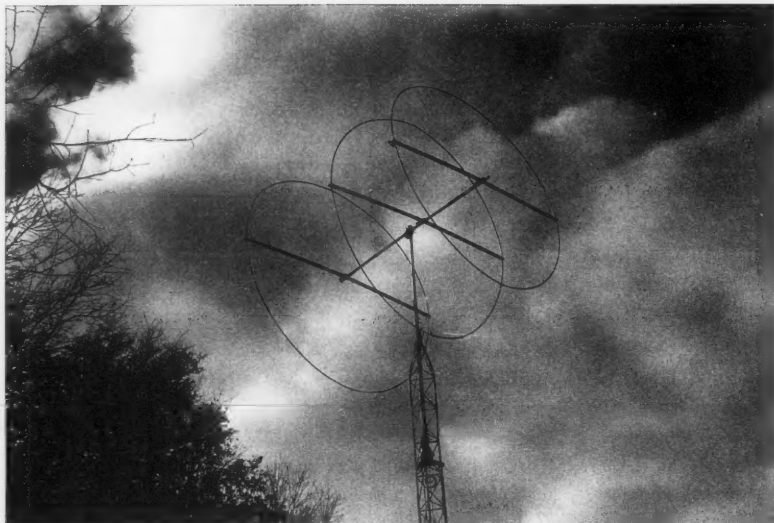
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**Photo A.** K8IHQ's circular quad is an impressive sight.

lug attached to a screw on the flange of the receptacle and the other wire soldered to the center terminal. Now push into the T-coupling opening after applying some clear silicone caulk. Let it set overnight to ensure setup of the caulk. The next day, connect the coax to the element and test it with low power for SWR and frequency centering. Usable bandwidth should be in excess of 400 kHz, with a 1.3:1 or less SWR rising up to 1.7:1 for approximately 800 kHz. Most modern transceivers require the use of an antenna tuner; therefore the antenna will give a

1:1 SWR after tuning over the entire 10 meter band (28.1 through 29.7 MHz). Quads are low Q resonators and therefore have wide bandwidth.

While the driven element is stabilizing, work on the director and reflector elements can be done. Starting with the reflector element, the next four CPVC pipes can be cut to 9 feet 2 inches, which relates to approximately 36.5 feet in circumference or approximately 4% larger than the driven element. Note that the spacing on the boom will be 6 feet, resulting in a 0.17 lambda. This space has been shown to

give best results as a reflector element. Again, cut off a 38-foot piece of copper wire and insert and assemble the reflector as was done with the driven element. Ensure that the T-connector is facing outward from the loop so that it will face the ground when hoisted into position. Before gluing this connector, make sure each end of the copper wire comes through the opening. Take each end and wind around the outside of the CPVC tubing as per the detail drawing, i.e., two loops, and cut. This will ensure that nothing bad happens when everything is hoisted into position. Again, the length of the copper wire is not super critical. Allow the opening on the T-connector to remain open (do not close with caulk)—condensation must be able to vent from the tubing.

Next is the director element. Construct it as the reflector element. Cut four CPVC pipes to a length of 8 feet 4 inches each. This will result in a 33.5-foot circumference, again 4% shorter than the driven element. This will be mounted about 4 feet in front of the driven element, which relates to a 0.11 lambda spacing. Terminate the copper wire as was done on the reflector element.

Now that we have the elements made, we must insert the horizontal cross members for boom mounting. These cross members are made of PVC-DWV 1.5" plastic pipe. Take one of the pipes and cut the following pieces: reflector, 18 inches (11 feet 6

*Continued on page 25*



**Photo B.** Closer view of beam and elements.

Elements	
Reflector	4 x 9 ft. 2 in. pipes (36.5 ft.) — +4%
Driven	4 x 8 ft. 9 in. pipes (35.0 ft.) — 0%
Director	4 x 8 ft. 4 in. pipes (33.5 ft.) — -4%
Cross Members	
Reflector	11 ft. 6 in.
Driven	11 ft. 0 in.
Director	10 ft. 6 in.

**Table 2.** Lengths.



# From the Ukraine: A Radio Amateur's Story

## *Part 2: Water-cooled amp? Why not?!*

Vladimir Skrypnik UY5DJ  
Pravdinska, 58  
Kharkiv - 107  
310107 Ukraine  
[uy5dj@UYØLL.ampr.org]  
[uy5dj@yahoo.com]

**M**y teenage interest in amateur radio helped me make the right choice for a profession. In 1966, I became a first-year student at the Kharkiv Institute of Radioelectronics.

I was very surprised to discover that there was neither an amateur radio club nor a station there. After short investigation, I learned that a formal license and club call sign, UT5KDS, had been issued. However, there was neither a room nor equipment for the radio station. I took the initiative and contacted the Institute's authorities, and it worked! Within a few months, we were given a rather large room on the top floor. It was an archives room, and there were no windows. But we young hams were delighted—especially to be so close to the roof for our antennas! We applied our youthful energies, and in a short time we made our station a reality. The authorities, and some of the faculty, gave us some old but unused equipment. The best gift of all was a military HF receiver; it covered all amateur bands and it was in complete working condition.

I should mention here that in the late '60s, in the former USSR, most amateurs still used separate receivers and transmitters. And in most cases, transmitters were homemade. During this time, I acquired an old German three-stage CW transmitter, a relic of WWII. It was a rather big and heavy metal box containing a few tubes of unusual and strange construction. Unfortunately, I was unable to find direct replacements or even substitutes. I completely rebuilt this unit into a power amplifier, and ended up using only the big cabinet and heavy-duty RF power parts. Later on we made an exciter, and put up a few longwire antennas.

After all of our preparations, our student amateur radio club finally got on the air. It was September 1967. The club station soon became the center of activity for new hams entering the Institute each year, and for a lot of newcomers who also wanted to become involved with the magic world of shortwaves.

But the Morse code barrier stopped them. I needed to do something to help them overcome this barrier.

I soon established a Morse training class. This complicated my already busy student life. I had all of the normal duties and responsibilities of a student—lectures to attend and laboratory exercises to do—except that I no longer had free time! While other students enjoyed their free time, I had to run either to the top floor or to the basement to conduct Morse classes. I conducted two-hour Morse classes twice per week, and it produced results. Soon there were more and more active CW operators of UT5KDS taking their first steps on their journey to become amateur radio operators. Most of this activity was on the 7 MHz band, because there were enough stations there operating rather slowly. And this band was open every day in any season.

Let me take a step backward and reminisce for a moment. In the springtime of 1967, I had recently learned Morse code, and I made my first CW QSOs on 28 MHz at my home station, UB5EFP. I now wanted to get a higher-category license, and I would need more HF practice. During my summer vacation in 1967, I went to Oblast's



**Photo A.** Young students at club station UK5LAP in 1973. Author's younger sister Natasha UB5LEZ is listening on the band. At center, Valentin Mykitenko UB5LEQ. Who could have known that he would become a famous operator from the Arctic and Antarctica, eventually owning 11 callsigns recognized around the world! At left is Alexander Goncharov, now RA3ZZ, but 4K1ZZ from Antarctica.

radio club, UB5KBB. While there, I asked to make a couple of CW QSOs on HF bands.

The chief allowed me to work under his control on 40 meters. With trembling heart and fingers, I sent my first CQ there. I got an answer from the operator, Misha, on the Crimean peninsula in the southern Ukraine. After some ordinary conversation, now possible with my knowledge of Morse code, I was pleased and satisfied with this first QSO on real HF with real QRM. This QSO remains in my memory after all these long years.

But let me return to the students' radio club ...

In the fall of 1968, we met the new operators entering as first-year students. I'm sure you can appreciate how surprised I was to meet one of the new students: It was Misha, the same operator with whom I made my first QSO on UB5KBB! As an operator, he was rather experienced and it was easy to work with him. Misha made hundreds of QSOs and participated in many USSR contests, and he was an active DX hunter.

Once the winter examination sessions of 1969 were over, we watched

for DX openings on 10 meters. It was a time of good solar activity, and during February there were beautiful days with propagation from North America. There were terrific signals for a couple hours every afternoon, and after each CQ or QRZ, we got a real pileup. There were so many stations from the USA calling us, it was really hard to operate. Misha and I rotated every hour, and still we were very tired—but we were really happy to feel that pleasant tiredness. It was a new experience to be in a role of DX. After several evenings, we found that it was better to operate while monitoring the band together, with two pairs of headphones. Almost 30 years have passed, but I still remember those impressive openings on ten meters.

### Unusual QSOs

Victor Polchaninov UT5TG, a faculty engineer and one of UT5KDS's operators, went on the Institute's 1969 Antarctica expedition. The faculty were conducting scientific research in the upper atmosphere, and Victor's assignment was to take care of the measurement equipment. The expedition

was headquartered at Molodezhnaya, at that time one of newest of the USSR's scientific bases.

The equipment worked properly, leaving Victor with plenty of time to organize a ham shack there.

Perhaps an explanation is required here: In past years, not every expedition had an amateur radio operator included in the expeditionary crew, and there were no fixed amateur radio positions on the bases. Even the callsign, UA1KAE, was a community one, and required a licensed amateur radio operator. Most radio communications were conducted using the standard communications center. Sometimes amateurs would set up their own stations by using equipment brought from home. This allowed them to operate from their own work site or living quarters. The callsign UA1KAE was reserved for the Russian Antarctica "capital," Mirny base. At the Molodezhnaya base, UT5TG used a slightly modified callsign, UA1KAE/I. Operation using your home or other special callsign was prohibited.

Victor rebuilt an old, surplus scientific HF radar antenna for 28 MHz operation. The landscape would not permit him to install higher and longer antennas for the lower bands. You must remember that Antarctica is an icy continent, and there are no trees or high buildings. Victor also built a power amp to provide a couple hundred watts, and he was now ready to operate CW on ten meters. But, in spite of the best equipment, radio frequency communication ultimately depends on wave propagation. From here in the Ukraine, it seemed like it could be accomplished very easily, because during the fall of 1969 and winter of 1970 there were frequent openings from UB5 to PY, LU, CX, YV, and so on. But, in fact, those ionospheric refractions were good only for the middle latitudes, and absolutely different for polar regions. This is true for both the north and south polar areas.

I spent a couple of months at UT5KDS monitoring ten meters, when the band was open to South America. But QSOs with UA1KAE/I were very seldom, and after several attempts, we

agreed with Victor to check only one frequency, 28.560 kHz, every Tuesday and Friday at 5 p.m. This was a good time, because the working day was over, and Victor's strong signal would not interfere with scientific measurements.

I was so surprised when this schedule began to work! After several attempts, I found that I could hear his weak CW signal regardless of band conditions. However, signals were 539-559 during most of time, and the narrow bandwidth signals were excellent to read. The most significant thing about this was that it was repeated every day at the appointed schedule. The only exceptions were when something interrupted Victor's normal life there in Antarctica, or mine there at my QTH.

When the summer season of 1970 came, the band was quiet and seemed almost dead. Only domestic or short-skip signals were heard, but nonetheless our weekly skeds were unusually stable. Twice per week, for several months, we had CW contacts with Victor. We exchanged amateur news, and often he received regards from his family. Even the chief of the faculty was quite surprised at how fast and reliably we were connected with Antarctica via amateur radio. Many times he visited our radio shack to watch the sked in operation while the band conditions were otherwise very poor.

We were all very surprised by the nature of this phenomenon, and its unusual propagation. Thirty years have passed, and I'm still seeking an explanation. Perhaps we amateurs experienced this anomalous phenomenon for the first time. To our understanding, it was propagation along the line of the Earth's magnetic field. Perhaps science can now explain the true nature of this wave link between two points, one in the northern hemisphere and the other in the southern one, connected by almost the same meridian. But we ham radio operators were happy and proud to have experienced such a previously unknown matter.

### Field Day 1970

The operators of UT5KDS in 1970 were oriented exclusively to CW operation on shortwave. We simply did

not have an SSB exciter, and Morse code mode was all that was available. Most of time, after our lessons and laboratory work, we students would spend several hours on 40 and 20 meters. These were our favorite bands.

Our first experience with VHF was due to the enthusiasm of Vadim Shevchenko UB5BUK. He worked as an assistant in one of the faculty laboratories. Vadim told us stories about 2 meter operation, but we weren't very interested because it seemed to us like very short distances were covered in a very complicated way. Vadim and his fellow VHF enthusiasts planned to be

in an annual Field Day contest. But they didn't operate CW at all, and they asked me and Misha to join them. We agreed. This would give me a chance to observe and participate in a VHF event. It would also provide experience with other kinds of amateur equipment and new operating techniques, and an opportunity to share our CW skills.

Once again, let me take a step backward and explain our contest rules ...

In the former USSR, during those years there was only one Field Day per year, exclusively on VHF and UHF. Participants were spread all over the

### MikeMaster



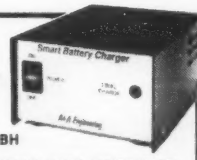
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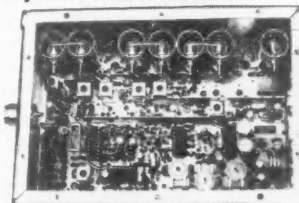
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countryside, trying to occupy a place atop the high hills and at reasonable distances from other participants. The usual practice was to use an ordinary home callsign and add "/P". There was another large group of participants operating from their homes. They were in another category and earned fewer points per QSO. During the contest, there were three periods of 6 hours: one session each for 144, 432, and 1296 MHz. CW and phone (AM) modes were allowed, with repeating QSOs with the same participants after one hour. Our team was oriented mostly on the 2 meter band, but we also had one set of equipment for 432 MHz.

The Institute authorities helped me with transport, and we loaded a whole lorry with numerous bags and boxes containing rather heavy equipment—including a tall mast and huge antennas. We transported this cargo to the position we had selected. It was 60 km north of Kharkiv and close to the Russian border. Our site was the highest point in the area. It was marked by an old wooden triangle sign at the top of a small artificial hill. It looked like a green island in a center of a huge field of flowering buckwheat. There were no trees nearby, and we had a nice view to the horizon in any direction. It was a beautiful sunny summer day, and the whole field was white with buckwheat blossoms. In this country, this is one of the favorite plants of bees. It baits them with delightful fragrance and sweet nectar. The air around had a beautiful honey smell. We, mostly indoors people, were very impressed by this wonderful, clear day.

First of all, we installed the big yellow tent for our operating position. Then we began assembling a big antenna for the 2 meter band. It was a 15-element-long yagi with a 30-foot-tall mast. All of us left our other duties and concentrated our energies on erecting this antenna. Three of us were in the center near the mast, and the rest were holding the supporting guy wires. Once the mast was in the vertical position, one of our crew wired the ends of the guys to the anchors already hammered into the soil.

We were all dressed as though on an outing at the beach. It was a nice opportunity to expose our pale indoors bodies to the sunbeams. Suddenly, our attention was attracted by the shouting of UB5BUK. He was jumping like a dancer and making a terrific noise. But we couldn't understand what was happening. He was clutching the guy wire to support the antenna mast and could not let it loose. The reason for the noise and wild jumping was a small bee. The buckwheat plants in that place were tall and waist-deep. And one bee working at the flowers had stung him just between the legs ...

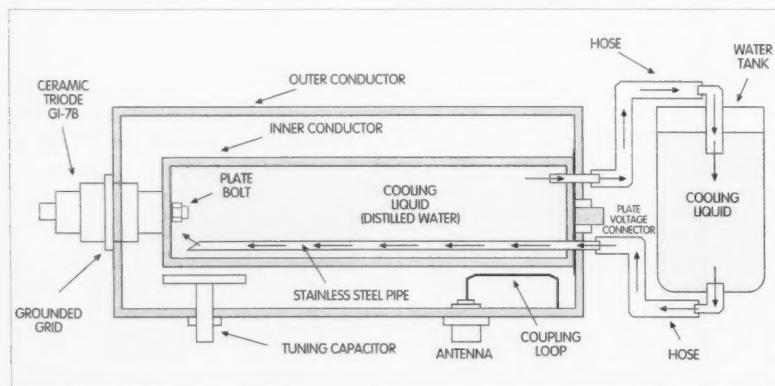
At last everything was arranged, and we were prepared to start the contest. Equipment was switched on. It was almost all home-built, except for the receiver, which was an old military one. I have to emphasize that everything was completely tube-type equipment. Semiconductors were almost not present there—only rectifiers in the power supplies. We used separate receivers and crystal-controlled single-frequency transmitters. Low-noise

converters transferred weak signals from 144 MHz to some portion of the HF spectrum.

The most memorable piece of equipment was the power amplifier. I remember well this original construction design by Nick Zinchenko UB5GNZ. As shown in **Fig. 1**, it employed a ceramic triode in grounded grid configuration with a quarter wavelength output coaxial resonator. Outer and inner conductors were made of copper tubing. Flanges were provided at the ends, and a thin Teflon film insulator was used to make a VHF shortening capacitor on the end opposite the triode end of the resonator.

Physically, the resonator's length was shorter than a quarter wavelength. It allowed use of a tuning capacitor in the form of a metal disk placed near the anode end. RF energy was taken from the coupling loop near the closed end of the resonator. We also used an external coaxial relay to change the antenna from the receiver to transmitter.

The input parts of the power amp were not so interesting and are not shown in the figure. The most unique part of this construction was the water cooling system for the tube. The inner resonator's conductor was made in the form of a cavity. It used part of a stainless steel pipe to deliver cooling water to the source of heating—the plate end. The choice of material was made to ensure poor thermal conductivity of the pipe, and to provide convectional flow of the distilled water in the resonator. Hot water moved up to a short piece of pipe at the right upper corner. It used an external glass water tank for cooling the water. The tank and resonator were connected by two pieces of rubber medical tubing. Also, the air bubbles disappeared in this tank to allow the normal convection flow. Today, looking back, it was an overly complicated system, but it was passive and quite effective. The water was also under high DC potential, and of course, it was dangerous. But this solution for cooling the tube plate is, to my knowledge, unique in amateur practice. This PA delivered 50 W of RF power and, in combination with a long yagi antenna and good operating site, it



**Fig. 1.** UB5GNZ's water-cooled amp.

provided the possibility of good results in the contest.

The details of the contest itself are not really important. However, our most significant objective was to contact someone from the northerly direction—someone in Russia.

Most of the accessible Field Day contestants were from the southeastern Ukraine, because this area contained highly developed industry and larger concentrations of radio amateurs. No one had ever worked our northern neighbor country previously on 2 meters, but we knew that Russian amateurs were also pointing their antennas toward us. Our task was to face one another pattern-to-pattern at just the right time. After several attempts, I found weak CW signals from Russia. As I recall, it was UA3KYB. We had a nice QSO, and after one hour repeated again. It gave us some very good points for the contest. But, most of all, I'm still proud that it was a truly historical moment: the first QSO between Ukraine and Russia on 2 meters had become a reality. It was in June 1970 ...

Note: The names of all fellows mentioned here are real, but some call signs were changed later several times. The club station for our students became UK5LAP and this new call sign took its place in thousands of amateur logs all over the world.

I would like to express my gratitude to my friend David Evison W7DE, for reading and preliminarily editing (in a language sense) this article.

### Three-Element Circular Quad

*continued from page 20*

inches) total; driven, 12 inches (11 feet 0 inches) total; and director, six inches (10 feet 6 inches) total.

Take these pieces and glue to each additional 10-foot pipe to make the required lengths. Now take a hack saw and cut 0.5"-wide, 2"-deep cuts in the pipe as per the drawing. Pliers can be used to remove the excess to clear the slots. Now place the cross member into each loop. Drill holes into the cross members to accommodate the 1/4" x 3" bolts as per the detail drawing. These

slots and bolts will keep the coupling of the element locked into place.

Now drill holes to accommodate the U-bolts per the detail drawing, ensuring that the U-bolt is centered. Next, drill holes into the center of the galvanized plates and insert pipe, bolt, and plate together. Now drill very small holes through the plate and PVC pipe so as to allow a stainless steel sheet metal screw to anchor the plate to the pipe.

Now the element is ready for mounting onto the boom. When all the elements are done, mounting on the boom may take place. I recommend that this be done at ground level. Once the elements are mounted to the boom, again drill small holes at the end of the plates as before and attach two stainless steel screws through the plate and into the galvanized steel boom. Once assembly is completed, connect the coax and test with low power RF. SWR will be 2:1 or a little more while on the ground. The 1:1:1 or better will be seen once the antenna is aloft.

This antenna system did not require very many hours of construction time nor a lot of bucks to obtain 9 dB gain over a dipole system. The DX will hear you very respectfully with just 100 watts. Good DX!

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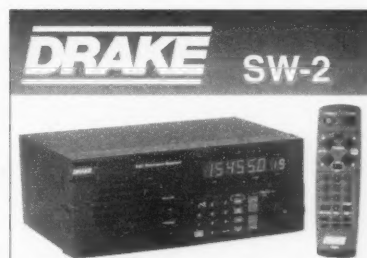
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# Easy Antenna Reference

## Part 2: More options.

Keith Woodward VK2AT  
19 Dolphin Ave.  
Taree NSW 2430  
Australia

**P**art 1 of this article (February 1999) covered some quick and easy basics to enable you to make some simple decisions. Here, we'll look at some more options.

To round off the simple approach, let's consider the antennas in **Figs. 1** and **2**. An easy-to-construct antenna is the folded quarter-wave. This antenna is a variation of a ground-plane antenna and works best with a good ground-plane or resonant radials. Theoretically, it should exhibit a feed impedance of 39 ohms and may be fed with 50-ohm coaxial cable. An antenna tuner will most likely be required.

The antenna consists of a quarter-wavelength of heavy-duty wire with an insulated support at the point where the wire changes from vertical to hori-

zontal (or thereabouts). The length may be calculated by dividing 234 by the frequency of operation in megahertz. The answer is in feet. As always, be generous and make the antenna too long—then prune to resonance. Make the largest amount possible vertical and then put the remainder in a horizontal position. If this is not possible, one support allowing a sloper (diagonal) erection will still give fair results.

Should you suffer from lack of real estate, then the folded "T" configuration may be your solution. I suggest that this antenna be made from slotted 300-ohm ribbon. The horizontal section of the "T" may be calculated from

$270/f_{\text{MHz}}$ , the answer again being in feet. Each end is shorted, and the center of one side opened to join the ribbon feeder. Calculate the feeder length by multiplying 270 by the velocity factor and dividing the answer by the operating frequency in megahertz. A typical velocity factor for this type of ribbon is about 0.82. This is claimed to give an approximate 50-ohm feedpoint. Expect to use an antenna tuner for best results.

For the higher frequency bands, another wire antenna that radiates vertically with broad bidirectional lobes is illustrated in **Fig. 3**. It is simple to feed with 50-ohm coaxial cable, and with a gain of 3 dB over a ground-plane, it gives good results over a fixed beam area.

This does not at all exhaust the configurations of simple wire antennas.

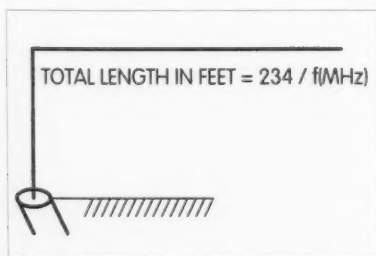


Fig. 1. Folded quarter-wave antenna.

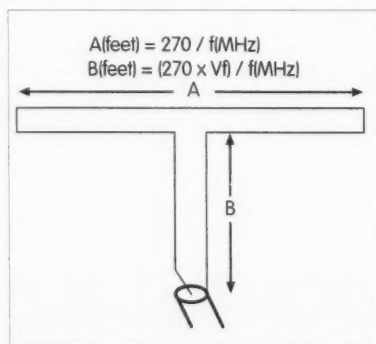


Fig. 2. "T" antenna.

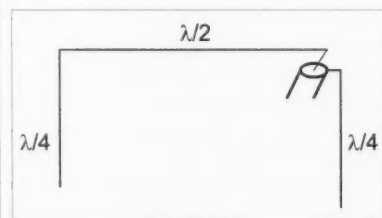


Fig. 3. Phased verticals.



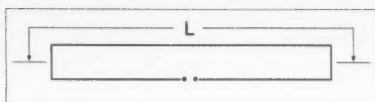


Fig. 4. Folded dipole measurement.

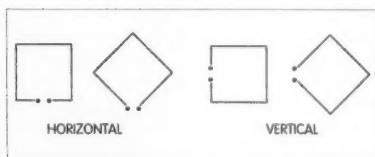


Fig. 5. Polarization of quad antennas, based on orientation of feedpoint.

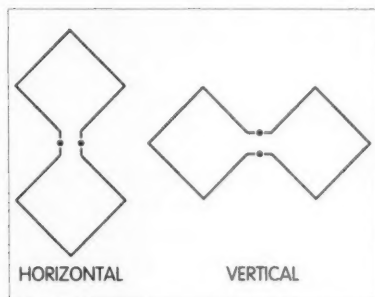


Fig. 6. Dual-quad configuration.

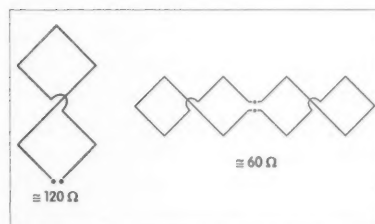


Fig. 7. Other quad combination suggestions.

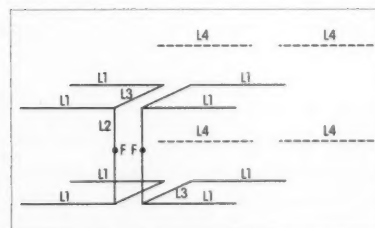


Fig. 8. Extended flat-top beam, with gain of approximately 10-12 dBd.

Having promised to pass on information about quad antenna configurations, I will endeavor to do so after the following brief interlude.

One question I have often heard is, "How do you measure the elements of a folded dipole?" Assume that the

folded dipole is for VHF/UHF, made of aluminum tubing, and self-supporting, somewhat such as used in a TV antenna. The length dimension applies to the overall length of the unsplit element from the midpoint of one end jumper to the midpoint of the other end jumper. This is illustrated in Fig. 4. The impedance of the folded dipole (half-wave) is four times that of a single half-wave dipole in the same surroundings, such as supports or additional elements. It is assumed that the upper and lower elements of the folded dipole are the same diameter.

An easy-to-remember method of calculating the length of a folded dipole is to divide 5555 by the operating frequency in megahertz. The answer is in inches, e.g., 5555/147.4 equals 37.6865 inches, or 37-5/8 inches. The big factor in favor of folded dipoles is their wide bandwidth of operation—hence the reason for their use in many TV antennas.

A useful, simple antenna is the quad. As illustrated in Fig. 5, it may be fed to give vertical or horizontal polarization. The total length of wire used to make a quad may be calculated by dividing 1005 by the frequency in megahertz to give the answer in feet. In metric, divide 306,324 by the frequency in megahertz to give the answer in millimeters. The quad exhibits approximately 100-125 ohms impedance, which varies with supports, height, and surrounding objects. It has an approximate gain of 1.5 dB over a dipole and a lower angle of radiation. A close match to 50-ohm coaxial feeder may be obtained by using an electrical quarter-wavelength of 75-ohm coaxial cable between the feedpoint and the 50-ohm feeder.

The dual-quad configuration, Fig. 6, gives a bidirectional pattern with a reasonable gain of approximately 3-4.5 dBd. The horizontally polarized configuration produces a good low angle of radiation. The size of this configuration may limit it to the upper frequency bands. In Fig. 7, another dual-quad configuration is shown. Some enterprising amateur might like to parallel two of these in the horizontal plane, both increasing the bidirectional gain and

	21.2 MHz	28.4 MHz
L1	6722 mm	5018 mm
L2	7076 mm	5282 mm
L3	3538 mm	2641 mm
L4	6504 mm	4855 mm
L5	1415 mm	1056 mm

Table 1. (See Fig. 8.) A broadband, high-gain antenna sometimes referred to as a "Lazy H." Note that tuned feeders connect to the points marked F.

reducing the feedpoint impedance to approximately 50 ohms. At 28.4 MHz, such an array would be about 100 feet long and approximately twelve-and-a-half feet high.

Finally, for those amateurs who like to challenge the elements (literally) and have the room, Fig. 8 shows details of the extended flat-top beam. It may be built with or without directors, which are spaced at about one tenth of a wavelength (see dimension L5 in Table 1). Best results may be obtained using open-wire feeder and an antenna tuner. If a quarter-wave shorted stub is used, the system could be matched to a coaxial cable transmission line.

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# Screwy Mobile Antenna Mods

*Fine-tune that screwdriver-type with these helpful tips.*

Jack M. Glandon WB4RNO  
4905 James St.  
Huntsville AL 35811  
[mglandon@worldnet.att.net]

I use a motor-tunable screwdriver-type mobile antenna for HF mobiling. My mobile antenna is an H-100 High Sierra™ model that actually was a gift from Dennis Peacock WB4KEA.

After installing the antenna on the left rear of my 1993 Camry, the initial test of the H-100 indicated that the best VSWR obtainable anywhere from 80 through 10 meters was 3.0:1, regardless of the location of the tap on the bifilar-wound matching transformer. Also, the location of the DC power leads for the motor affected performance of the antenna.

The DC power leads affected antenna performance because the leads were

coupled at RF frequencies to the antenna through the antenna motor. At the point of exit from the antenna mast, 140  $\mu$ H inductors were placed in series with each DC lead to decouple the antenna.

With the matching transformer removed, the antenna could be matched to 50-ohm coax by switching in discrete capacitors for each band. However, switching bands required not only tuning the antenna, but also stopping the automobile and switching in the appropriate capacitor at the antenna base for the band of intended use. A fixed, broadbanded matching circuit was needed that covered 80 through 10 meters. My solution was the circuit described below.

With the matching transformer removed, the antenna measurements shown in Table 1 were made with my MFJ-259B.

Unfortunately, the MFJ-259B does not read the sign of the X component. However, the reactive component is believed to be very near zero at the antenna because the antenna impedances were measured through 1.5 feet of coax. If a load of  $15 + j0$  were measured through 1.5 feet of 50-ohm coax, the measured impedance at 7.2 MHz would be  $15.17 + j4.03$ .

The 80 and 40 meter impedances required transforming approximately 15 ohms to 50 ohms. However, the 20-meter band and above impedances did not require any transformation to obtain a 1.3:1 VSWR match.

Two L sections were chosen to transform 15 ohms to 50 ohms at 80 through 40 meters in order that a lower Q per section could be used, resulting in greater bandwidth.

High pass L sections were chosen over complementary L sections (with the loss of some bandwidth at 80 and

Freq. (MHz)	R (Ohms)	X (Ohms)	VSWR (:1)
3.831	16	4	3.3
7.134	15	3	3.5
14.07	37	2	1.3
21.0	49	4	1.0
29.5	48	2	1.0

Table 1. Measurements with matching transformer removed.

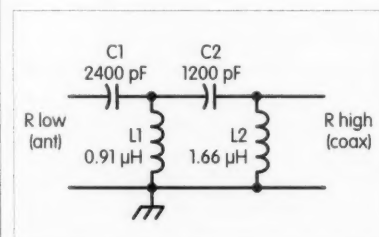
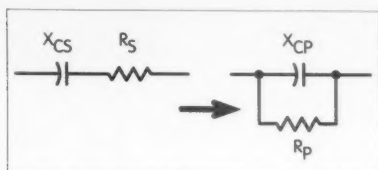


Fig. 1. High pass L matching circuit. C1: two 1200 pF 500 V silver mica capacitors in parallel. C2: 1200 pF 500 V silver mica capacitor. L1: 4-3/4 turns #20 wire, close-wound on 1-1/16-inch o.d., 2-inch-long PVC pipe. L2: 6-3/4 turns #20 wire close-wound on the opposite end of the PVC pipe from L1.



**Fig. 2. Series/parallel equivalent circuit.**  
 $Q = X_{cs}/R_s$ .  $R_p = R_s(1 + Q^2)$ .  $X_{cp} = X_{cs}(1 + 1/Q^2)$ .

Freq. (MHz)	R (Ohms)	X (Ohms)	VSWR (:1)
3.8	52	0	1.0
7.0	50	15	1.3
14.2	42	3	1.1
21.4	49	0	1.0
29.6	48	8	1.1

**Table 2. Measurements with L matching unit at base of antenna.**

Freq.	VSWR
3.5	1.4:1
3.8	1.3:1
4.0	1.2:1
7.0	1.2:1
7.3	1.2:1
14.0	1.2:1
14.3	1.2:1
21.0	1.2:1
21.45	1.2:1

**Table 3. AC4TK measurements with 500 W into matching unit.**

40 meters) so that the matching circuit would act as a high pass circuit and allow the transmitter to "see" the actual antenna impedance without transformation at 20 meters and above. The circuit is shown in **Fig. 1**.

The formulas used here are algebraic variations of the fundamental series to parallel equivalent circuit transformations as shown in **Fig. 2**. The minimum Q that is required for the 15:50 impedance transformation is 0.9 per L section. The transformation in the first L section is  $15(1 + Q^2) = R_t$ , and the second L section is  $R_t(1 + Q^2) = 50$ .

Therefore, two independent equations yield:  $1 + 2Q^2 + Q^4 = 50/15$ . Solving for Q,  $Q = 0.9$ .

The first L section comprising C1 and L1 transforms as follows:

Equivalent R seen across L1 is R low  $(1 + Q1^2) = 15(1.81) = 27.15$  ohms.  $X_{C1}$  is selected to result in the appropriate Q of 0.9.  $Q1 = X_{C1}/R$  low,  $0.9 = X_{C1}/15$ ,  $X_{C1} = -13.5$ .

Equivalent  $X_c$  across L1 is  $X_{C1}(1 + 1/Q1^2)$ ,  $-13.5(1 + 1.23) = -30.16$ . The magnitude of  $X_{L1} =$  equivalent  $X_c$ ,  $X_{L1} = +30.16$ .

The second L section comprising C2 and L2 transforms as follows:

Equivalent R seen across L2 is R transformed  $x(1 + Q2^2)$ ,  $27.15(1.81) = 49.17$  ohms.

$X_{C2}$  is selected to result in the appropriate Q of 0.9.  $Q2 = X_{C2}/R$  transformed,  $0.9 = X_{C2}/27.15$ ,  $X_{C2} = -24.45$ .

Equivalent  $X_c$  across L2 is  $X_{C2}(1 + 1/Q2^2)$ ,  $-24.45(1 + 1.23) = -54.64$ .

The magnitude of  $X_{L2} =$  equivalent  $X_c$ ,  $X_{L2} = +54.64$ .

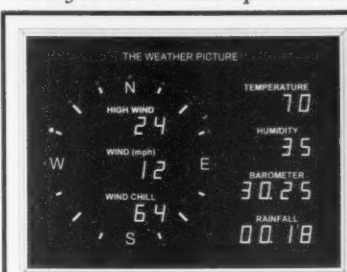
Component values were selected at the geometric mean frequency between 3.8 and 7.3 MHz, or 5.26 MHz. F is the square root of  $(3.8 \times 7.3)$  so that the network would transform at 3.8 MHz equally as well as at 7.2 MHz. Decreasing the value of C1 will favor 7.2 MHz at the expense of 3.8 MHz. In like fashion, raising the value C1 will improve the VSWR at 3.8 MHz at the expense of 7.2 MHz.

$C = 1/(2\pi F X_c)$  and  $L = X_L/(2\pi F)$ . Therefore,  $C1 = 2241$  pF;  $L1 = 0.91$   $\mu$ H;  $C2 = 1237$  pF; and  $L2 = 1.66$   $\mu$ H.

For the actual component values used, see **Fig. 1**. The measured results after installing the L matching circuit at the base of the antenna were as shown in **Table 2**.

Tony Faucher AC4TK was also having trouble getting his 500-watt Ameritron™ amplifier to work into his later model HS-1500 High Sierra™ antenna, because the amplifier is set at the factory to shut down if the load presents a VSWR of greater than 2:1 with 500 watts output. Therefore, Tony elected to try the above-described matching circuit. Tony obtained the

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# Operating Crystals on the Fifth Overtone

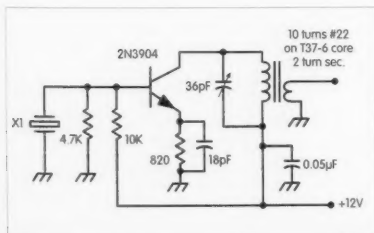
*Sounds kinda New Age, but it's something all hams should know.*

John Pivnichny N2DCH  
3824 Pembroke Lane  
Vestal NY 13850

**A**lmost all crystals, whether constructed for overtone service or not, can be made to oscillate on approximately odd multiples of their fundamental frequency. For many years the circuit shown in **Fig. 1** has been used in handbooks. We are led to believe that by tuning the tank circuit in the collector to three, five, seven, or nine times the crystal frequency, the crystal is made to oscillate on one of its odd overtones. And it works fine for the third overtone, but not so well for the fifth overtone. I've never succeeded in getting it to work on the seventh overtone, or higher, when using fundamental-type crystals.

## So what's the problem?

Assume the tank circuit of **Fig. 1** is



**Fig. 1.** Typical overtone oscillator circuit.  
30 73 Amateur Radio Today • June 1999

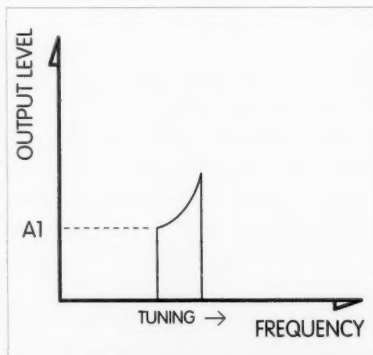
initially tuned to a frequency of about 50 kHz below five times the fundamental frequency of the crystal. For example, if X1 is a 10 MHz series-type fundamental crystal then assume LC is tuned to resonate at 49.950 MHz. As expected, this is too low and the circuit does not oscillate. Now, start tuning to a higher frequency by slowly decreasing the value of C (or L). You will reach a point where the circuit suddenly starts oscillating with an output level A1, shown in **Fig. 2**. The exact output frequency depends on the crystal's fifth overtone and not the tank tuning; that is, the crystal is in control. For the example above, it was measured as 49.976 MHz.

As the tank circuit is tuned even higher in frequency, the output level increases quite rapidly until at some point the circuit suddenly stops oscillating. For the fifth overtone, the starting and stopping points are close together, making the tuning quite critical. Worse, if the power is removed and reapplied, the circuit may not restart oscillating unless the tank is first detuned below the starting frequency and again slowly increased above the starting point. If you are lucky, a point

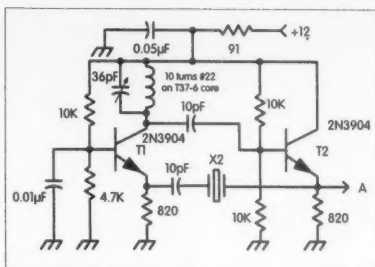
can be found somewhere between the starting and stopping points where the circuit will restart oscillating when power is removed and reapplied. This point has to be found by trial and error, since tuning for maximum output will not get you to the proper point. Overall, this starting situation is not a very satisfactory solution for either homebrew or commercial equipment.

## A better circuit

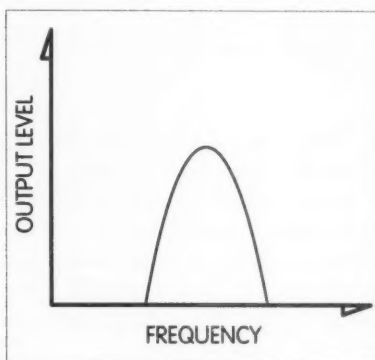
Referring to **Fig. 3**, we see a feedback-type oscillator circuit with the crystal connected between two low-impedance emitters. The tank circuit in



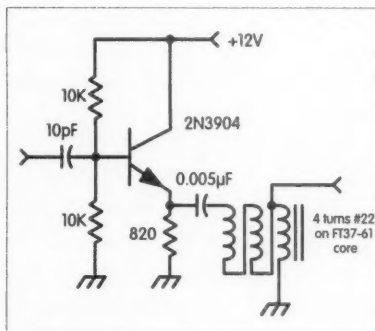
**Fig. 2.** Tuning typical circuit.



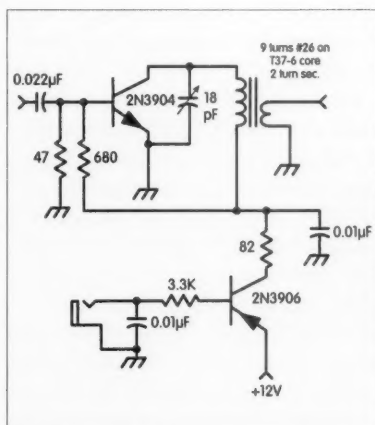
**Fig. 3. Improved overtone circuit.**



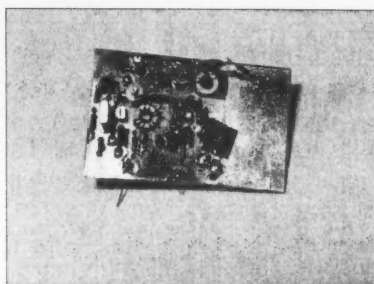
**Fig. 4.** *Tuning of improved circuit.*



**Fig. 5. Practical emitter follower circuit.**



**Fig. 6.** Amplifier with keying circuit.



**Photo A.** Circuit board with oscillator, emitter follower, and class AB amplifier.

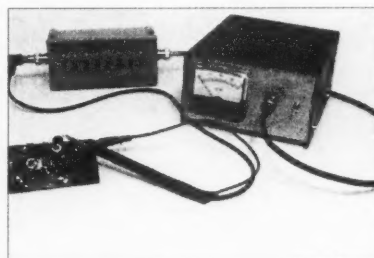
the collector of the common base circuit prevents oscillation at other than the desired overtone. This circuit works reliably on the fifth overtone.

Note the very different tuning curve in **Fig. 4**. The abrupt starting and stopping points are gone, and maximum output occurs as a broad peak centered at the overtone frequency. As before, the exact output frequency is determined by the crystal and not the tank circuit tuning.

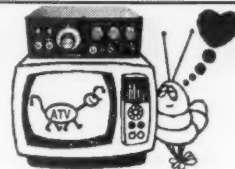
When tuned to the correct peak frequency, this circuit generates about one milliwatt of power. However, it is best to avoid drawing power directly from the circuit. An emitter follower circuit attached to the relatively low-impedance point A (see **Fig. 3**) presents a minimal load, yet provides an output for driving 50  $\Omega$  or lower-value loads. A practical emitter follower circuit is shown in **Fig. 5**. Note the details for winding the RF transformer using a ferrite core.

### But what's the frequency?

If you're lucky enough to have a crystal cut for fifth overtone oscillation, then the output frequency will be just what is marked on the crystal



**Photo B.** Measuring the output level with step attenuator and dBm meter.



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holder (can). Other crystals will oscillate on approximately five times their fundamental frequency. How approximate? The only way to find out is to build the circuit and measure the frequency. My microprocessor crystal marked 10 MHz actually oscillates at 49.972,590 MHz! That's with a 10 pF series capacitor, as shown in **Fig. 3**. The frequency can be "pulled" slightly (about 5 kHz) by varying this series capacitor from 5 to 20 pF, as shown in **Fig. 6**. Do not attempt to increase this capacitor much above 20 pF. Otherwise the crystal may lose control and the circuit will become a self-excited oscillator with the crystal appearing as a series capacitor (its holder capacitance). The frequency will then be determined by the tank circuit at the collector of T1. The frequency will now vary considerably as the tuning of this tank circuit is adjusted. That is fine if you want to build a VFO—but then you don't need a crystal at all!

Some authors have suggested adding an inductor in parallel with the crystal to cancel out the holder capacitance at the overtone frequency. This may help if you need to go to a higher series capacitor to "pull" your frequency a little lower. But it also introduces another inductor, which can introduce

resonances and oscillating frequencies other than the one intended.

### Stepping up the power

A class AB amplifier can be used to increase the power to 30–50 mW. It is also a good place to insert a keying circuit for CW, as it will not affect the frequency. See **Fig. 6** for a circuit developed by Hayward and DeMaw. A low-pass filter in the output attenuates harmonics.

### Circuit construction

The final circuit, including oscillator, emitter follower, and class AB amplifier, is shown in **Photo A**. All the components are mounted on the foil side of single-sided epoxy-glass circuit board. Through holes are drilled and countersunk for clearance as component leads pass through the board. Interconnections are made on the back side using the component leads or extra wires as needed. The output frequency is easily measured on a frequency counter. I used the counter of an MFJ-259 SWR Analyzer. Output level, as shown in **Photo B**, is measured with an RF dBm meter. A step attenuator is also useful for making the level measurement. Note: The RF dBm meter and step attenuator are available in kit form from Unicorn Electronics, 1 Valley Plaza, Johnson City NY 13790; (800) 221-9454; [www.unicomelex.com].

### Suggested reading:

*Solid State Design for the Radio Amateur* by Wes Hayward and Doug DeMaw, ARRL, Newington CT, 1986.

*Radio Components Handbook* by Guido Silva, MFJ Publishing, Starkville MS, 1997.

### Screwy Mobile Antenna Mods

*continued from page 29*

results in **Table 3** when running 500 watts into the matcher:

The calculated loss of the matching circuit is believed to be in the order of 0.1 dB when the inductors have Qs of 100. An attempt to measure the loss with

Power	Peak Voltage	Freq. (MHz)	Load
100 W	67	3.5	Antenna tuned to 3.5
100 W	176	3.5	Open circuit
500 W	151	3.5	Antenna tuned to 3.5
500 W	394	3.5	Open circuit

**Table 4.** Calculated voltage stress on capacitors.

the MFJ-259B yielded an indicated 0-dB loss from 3.5 through 28.7 MHz.

The calculated and modeled (but not measured) voltage stress on the capacitors is greatest on the smaller capacitor at the lowest operating frequency. The calculated voltages are shown in **Table 4**.

Therefore, 500 volt capacitors were selected.

In addition to the decoupling inductors on the DC lines and the matching circuit, Tony and I made the three following additional modifications to our High Sierra antennas:

1. To tighten the coil to antenna mast connection, a copper shim made of flattened 3/8-inch copper water pipe was placed inside the mast collar under the spring.

2. A 1 ohm 10 watt resistor was switchably added in series with the DC power leads to the motor to slow the coil movement at near resonance.

3. White nylon ties were placed around the transparent coil covering as band markers, visible through the rear view mirror.

In closing, I would like to thank Neill Fry K4AYD and Bill Earheart K4EGC for providing parts and technical assistance for this project, as well as Larry May K4QZF for inspirational encouragement. Each of these hams and others are part of the 3.8325 group which meets every morning at 8:00 a.m. CST ± QRM on 3.8325 MHz. I join the group on Saturdays and Sundays, and confess to having a strong compulsion to sway the topic under discussion in the direction of antennas.



# My Old Kentucky (Satellite) Home

*... where lofty aspirations met some down-to-earth concerns.*

Carole Barsky KA9SOF  
3236 Old Hartford Road  
Owensboro KY 42303

Part of amateur radio fun is indulging in the challenge of different modes of communication. After years of enjoying traditional QSOs on HF bands, two meters, 440, and slow-scan television, my husband Richard WAIGZY and I decided in the summer of 1996 that it was time to try satellite communications.

In selecting the right rig for this, we dealt only with monetary concerns and a few judgment calls. We finally settled on the ubiquitous Yaesu FT-736R.

However, our quest to send signals into space really began with antenna choice and installation, which at first presented us with seemingly insurmountable problems. Our heavily wooded back yard and the aesthetic concerns of neighbors (we live in suburbia) limited our existing antenna farm to a 50-foot Hazer tower near the back of our house topped with a triband three-element cubical quad that misses the roof only by several inches when we rotate it! Also, a Carolina Windom multiband dipole is tucked among tree branches.

The most logical approach for adding satellite-tracking antennas that could be rotated with ease seemed to be installa-

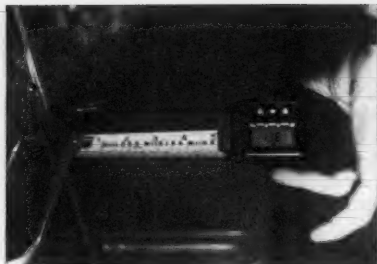
tion above the quad's boom. Before purchasing antennas, we pored over literature from the tower's manufacturer concerning weight restrictions. Then we measured the available space between quad elements and checked the quad antenna manufacturer's specifications.

Our preliminary work resulted in ordering the KLM 435-40CX for the 440

frequencies and the KLM 2M-14C for two meters. The boom lengths of those two antennas do not exceed the boom length of our quad, and the designs offer reasonable weight as well as some immunity to the harsh effects of rain and snow. One added bonus to the satellite antenna placement is that the circular polarity provides excellent



Photo A. Scott KS4IN and Rich WAIGZY finish constructing an antenna.

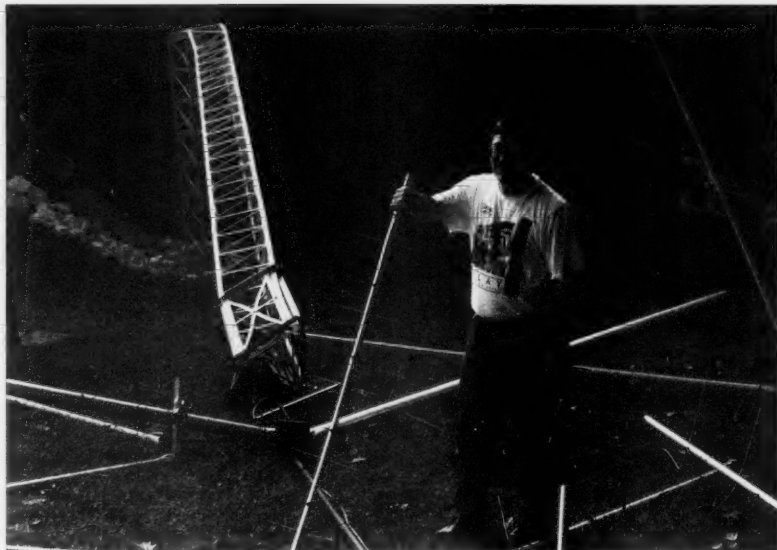


**Photo B.** Precise measurements ensure excellent results!

terrestrial signals for two meter/70 cm SSB, long-distance FM repeater contacts, and ATV (amateur fast-scan television).

Building the antennas was neither a simple nor painless project (Richard burned his left hand while soldering by picking up the wrong end of the iron), but with the help of several friends and a quick trip to the emergency room, we persevered and were rewarded with out-of-this-world QSOs!

We began the project by familiarizing ourselves with KLM's instruction manuals, gathering tools, and arranging antenna elements in the proper order on a table near the work area. After boom assembly, we propped the ends of the 2M-14C and 435-40CX booms on chairs to provide plenty of free space around the antennas. KLM provides color-coded pre-tuned elements that aid in correct placement, but accu-



**Photo D.** The results of a brief summer storm in 1997.

rately centering each element requires mathematical precision, elbow room, and a bit of patience.

The 2M-14C requires insertion of seven horizontal and seven vertical elements while the 435-40CX relies on two reflectors and 36 directors divided between two planes. We decided that a digital tape measure would ensure accurate placement of the elements, and it proved its worth throughout this phase of the project.

Mounting the antennas above the quad boom was a three-man job! Jerry

K4FZY, Scott KS4IN, and Richard manned ladders and strapped on safety belts to steady themselves near the lowered quad boom.

After a weekend of hard work, Richard gave the antennas their first trial run. Once Richard felt assured that the equipment was functioning satisfactorily, he encouraged me to give it a try. I tentatively put on the headphones and called CQ on *OSCAR-10*. A voice bounced back from North Carolina. I was operating a bird! The only difficulty I encountered was manually tuning the frequency at the proper rate to keep up with the Doppler shift. That talent comes with practice.

One year later, in August of 1997, misfortune struck our happy ham shack and brought all amateur activities to a halt. A brief but violent storm toppled the tower. After six years of withstanding more severe weather, the tower had seemed impervious to Mother Nature's extremes. However, after assessing the damage, including twisted antennas and shattered Fiberglass® beams, we concluded that the added weight of the satellite antennas, although not exceeding the manufacturer's recommendations, put a strain on the tower in high winds.

We were back to square one. For-



**Photo C.** Jerry K4FZY admires the project from his bird's-eye view.

# Telescoping PVC Mast

*Getting it up in awkward places.*

Darwin K. Ogden KB7WOS  
790 West 800 South  
Richfield UT 84701  
[d.ogden@juno.com]

**M**y family and I camp a lot, and good places to hang up antennas are sometimes hard to find. I decided I needed a mast that was very portable—meaning it had to fit in the bed of my full-sized pickup truck, be at least 20 feet tall when erected, be lightweight, and cost very little for materials. Ease of construction did not enter into my plans—but as it turned out, this is a very easy to build mast.

My first thought was to make it out of metal, but having installed my own sprinkling system, and having built many antennas with PVC pipe and fittings, my thoughts soon were turned to PVC. I wanted my mast to come apart easily, or, in some other way, break down to eight feet in length. A telescoping mast seemed the easiest solution for handling and storage.

After dry-fitting and laying the pipe out on the hardware store floor, I bought the parts for about \$20 and went home to try putting my new mast together.

A very important part of the mast is that the reducer bushings must be enlarged slightly so the pipe will slide through it. I used a drum sander in my

drill press to enlarge both reducer bushings.

## Construction

*H* in **Fig. 1** on pipe B is a 1/4-inch-diameter hole drilled through both sides of the pipe, 12 inches from the bottom. This is to hold pipe B in place when it is extended out of pipe A. I put a three-inch-long quarter-inch bolt through hole *H* and hole *I* in pipe C.

**Fig. 2** shows how all the fittings and pipes go together. I did not cement the fittings to the pipe. They have a taper fit and will hold very well with a little pressure. If you cement them they're stuck forever.

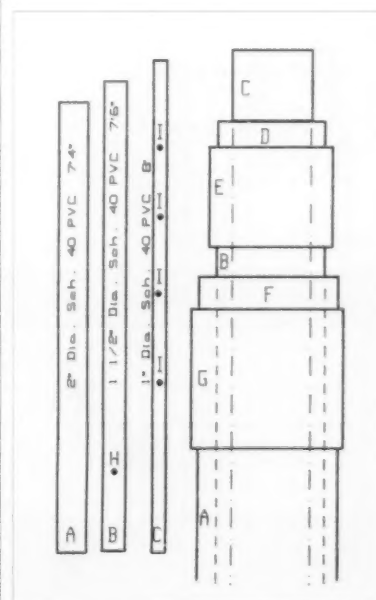
The two-inch coupler *G* presses down on the two-inch pipe A. The two-inch to one-and-one-half-inch reducer *F*, which has been reamed out so that the one-and-one-half-inch pipe will slide through it, fits into the two-inch coupler *G*.

The one-and-one-half-inch coupler *E* presses onto the one-and-one-half-inch pipe B. The one-and-one-half-inch to one-inch reducer *D*, which has been reamed out so that the one-inch pipe C will slide through it, presses into the coupler *E*.

Pipe C has quarter-inch holes *I* drilled at 12-inch locations starting from the top and ending about two feet from the bottom. These are to be used to adjust the height of pipe C.

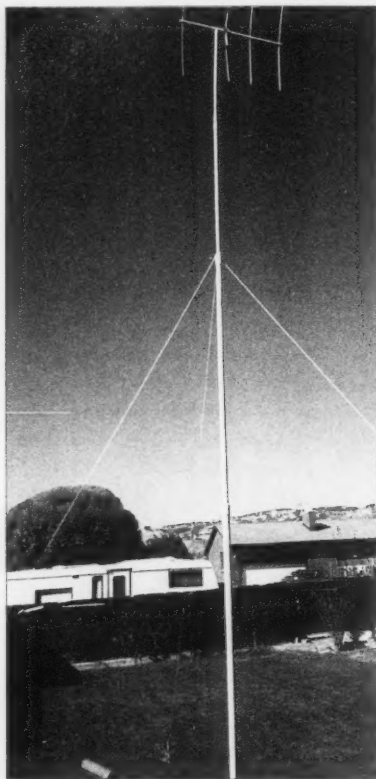
Pipe B fits into *F* and pipe C fits into

*Continued on page 36*



**Fig. 1.** Lengths. **Fig. 2.** The pipes.





**Photo A.** Mast with Insta-Flex two-meter yagi beam.

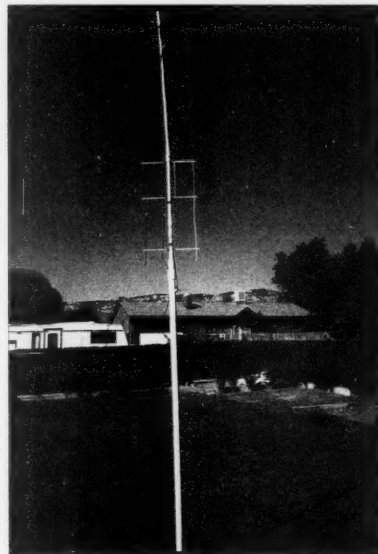
## Telescoping PVC Mast

*continued from page 35*

**D.** This all slides together to make a nice eight-foot-long collapsed mast. To extend it to 20 feet, pull C out to the bottom quarter-inch hole and insert a bolt through the hole. Let it rest on D. Pull B out to the quarter-inch hole H, stick a bolt through the hole and let it rest on F. I use three nylon ropes as guys; I loop them over C and let them slide down to rest on D. Alternatively, they could be made to attach closer to the top of C.

### Modifications

Another modification I made later was to place a one-inch wooden dowel inside pipe C for extra strength when supporting heavier antennas. The next modification was to get a one-inch coupler, sand it down so that it would slide inside pipe B, and set it on the bottom of pipe C, to take the slop out of the two pipes. Pipe B in pipe A is a good fit by itself.



**Photo B.** Mast with two-meter and 70 cm top-fed, out-of-phase, phased vertical antenna. Design by Nizar A. Mullani KØNM, from "Top-Fed, Out-of-Phase, Phased-Verticals (TOP) Antenna," published in March 1997's 73 Amateur Radio Today.

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1	7' 4" length 2-inch-diameter s/40 PVC pipe
1	7' 6" length 1-1/2-inch-diameter s/40 PVC pipe
1	8' length 1-inch-diameter s/40 PVC pipe
1	2-inch coupler
1	1-1/2-inch coupler
1	1-inch coupler
1	2-inch to 1-1/2-inch reducer bushing
1	1-1/2-inch to 1-inch reducer bushing
2	1/4-inch bolts, each 3 inches long
1	2-inch cap for bottom of pipe A

Miscellaneous: Nylon™ rope for guys; 1-inch-diameter wooden dowel for extra strength

**Table 1.** Parts list for the telescoping PVC mast.

I also have a two-inch cap for the bottom of pipe A. I sanded it out a little so that it will not fit too tightly and it can be taken off. I put the cap on when that mast is placed on the ground, and take it off if I want to install the mast on the two-inch-ball trailer hitch of my pickup truck (or the one on the back of my camp trailer).

Of course, my favorite antenna to set on top of the mast is the "Insta-Flex Two-Meter Yagi Beam" I designed, which was published in the April 1997 issue of 73 Amateur Radio Today (see **Photo A**). My PVC mast has also supported a 10-meter dipole made of surplus military whips. The latest antennas to grace the top of my mast have been Nizar A. Mullani KØNM's design. They're called the "Top-Fed, Out-of-Phase, Phased-Verticals (TOP) Antenna," and were explained in the March 1997 issue of 73. I have made both a two-meter and a 440 version of the "TOP"; they are easy to make and work well. (**Photo B**). *N.B. Check out Nizar's article—it's very interesting.* 73

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ates from 3 to 15 volts, consumes well less than a milliamp of current, has a speed control, and its dots, dashes and spaces are self-completing. You can't ask for more than that!

The circuit is centered on U3, a CMOS 555 timer used as a pulse generator. (If a regular 555 is used, the speed control resistor must be changed to 5 k, with a corresponding increase in

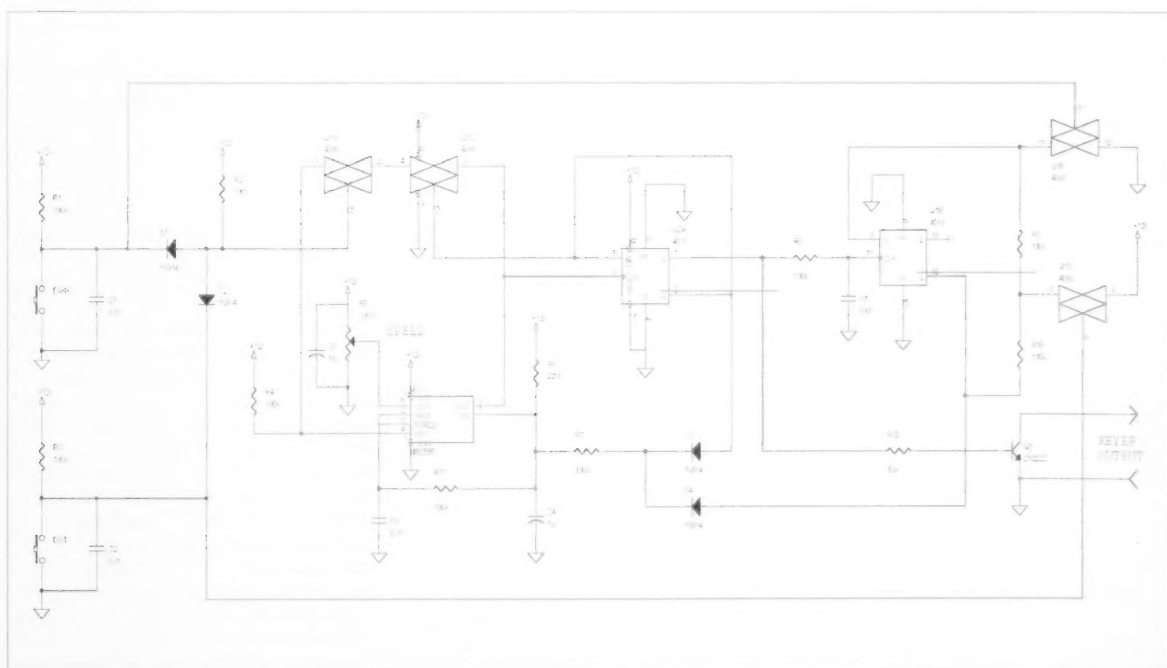


Fig. 1. Schematic.

PARTS LIST	
R1-4, 7-11	100 k
R5	100 k linear pot
R6	220 k
R12	10 k
C1-3, 5	0.01 $\mu$ F 25 V ceramic
C4, 6	1 $\mu$ F 16 V electrolytic
D1-4	1N914
Q1	2N2222 or equivalent
U1	4066 quad analog switch
U2	4013 dual flip-flop
U3	LMC555 CMOS timer

Table 1. Parts list.

power consumption.) The pulse generator is activated by the closure of either the dot or dash switch, and continues until the termination of the space at the end of the last character generated.

The pulse stream from the 555 enters U1A, a 4013 flip-flop, where the frequency is divided in half, so that a stream of dots will be separated by spaces of the same width as the dots. The "Q" output of this gate drives the gate of Q1, a 2N2222 transistor that keys the transmitter.

The length of the pulse generated by the 555 controls the length of the dot, dash or space signal. Normally, U3 produces pulses approximately 150 milliseconds in length. But when the anode of either D3 or D4 is held high, the pulse length of U3 is shortened to a nominal 50 milliseconds. This short-pulse condition occurs when either a dot or space is being produced.

Iambic operation (alternating dots and dashes) occurs when both dot and dash switches are pressed. In this condition, U1B drives the anode of D4 alternately high and low with each successive pulse from U1A, causing each keyed pulse to be alternately 50

or 150 milliseconds in length—the ideal one-to-three ratio for dot-to-dash weighting.

For the values shown here, the keyer will operate at nominally 12 WPM. The speed control pot allows the keying rate to be adjusted from roughly 8 to 25 WPM. If a higher or lower keying rate is desired, adjust the value of C4 up or down accordingly—larger values result in slower keying.

The entire circuit can be constructed on a few square inches of perfboard, and installed into a spare corner of your QRP rig. Alternately, you can install it into a dead computer mouse, using the mouse buttons for the keyer paddles. Use your imagination—and enjoy building this project! 73

#### My Old Kentucky (Satellite) Home *continued from page 34*

unately, our homeowner's insurance covered the damage, and Richard and Scott were soon in the midst of constructing a new tower and antennas. Today, the new cubical quad and satellite antennas continue to provide enjoyable QSOs, but to prevent further catastrophes, we now lower the antennas whenever there's a possibility of storms.

Some of the older amateur satellites are facing their ultimate demise as they approach the earth's atmosphere, and working those satellites while they are still operable brings the privilege of logging contacts on birds that will soon be just a fond memory.

Newer satellites make up for this loss by orbiting the earth with varying "footprints" or signal coverage on land, providing unusual opportunities for QSOs. Other satellites are in the planning or construction stages. Each generation of amateur radio satellites reflects the latest technology, helping to establish radio amateurs firmly in the ranks of producers of reliable space communications.

However, for the majority of hams who do not have the technical aptitudes or opportunities needed for satellite design and construction, the real challenge lies in building tracking an-

tennas that work within the terrestrial restrictions of back yards. That, and picking up the correct end of the soldering iron! 73

#### QRX

*continued from page 8*

keyboard-to-keyboard mode, PSK31, could provide an attractive alternative to CW. This technology provides the ability to have keyboard-to-keyboard QSOs with a narrow bandwidth and robust noise immunity on all bands. It does require some typing skill.

For anybody who might be interested in learning about this mode of operation, information about it can be found at [<http://aintel.bi.edu.es/psk31.html>].

Thnx to Ron Waxman W9KNB, in The North Shore (MA) Radio Club's *Transmitter*, March 9, 1999.

#### New DXCC Entity

Effective October 1, 1999, Palestine will be added to the DXCC List. E4 will be the recognized prefix. Contacts made with E4 stations after February 1, 1999, will count for this new DXCC entity. Under the DXCC rules, contacts with the deleted entity of Palestine made prior to June 30, 1968, will not count for DXCC credit. The ITU allocated the callsign prefix E4 for use by Palestine in Operational Bulletin No. 685 issued February 1, 1999.

Thnx to the *Cherry Juice*, newsletter of the Cherryland (Traverse City MI) ARC, February 1999.

#### Code Saves Destroyer!

I was a Navy CTM ordered to the destroyer *USS William M. Wood* (DD-715), in the summer of 1973. It was TAD (Temporary Additional Duty) from my duty station of Rota, Spain, and I was the only CT on board for the three months. All of my equipment on the ship was in an air-conditioned "van" (an aluminum-skinned equipment shelter) tucked away in the old DASH hangar, and my job was to maintain the gear in working order, doing PMs and repairs when needed.

The Wood was so crowded that some of the crew was hot-racking in the berthing spaces. I discovered there were bunks welded three-high on the front starboard side of the hangar, so I made the hangar my home. However, the DASH hangar wasn't really meant to be a living space. The only access I had into the rest of the ship was through a watertight door in the front bulkhead of the hangar, across the open ASROC deck and through another watertight door into the passageway leading to the ship's radio room. During storms I rigged a line from the hangar across the open deck so I wouldn't get knocked overboard when I went below for chow!

The equipment I maintained was mostly a lot of receivers, so I usually spent my days SWLing (short-wave listening), tuned to the ham bands, or copying various RTTY signals. The ship's Operations Officer was also a ham and one of the few people on board with a security clearance to be in the "van." We got on the air a few times in the ham bands using one of the ship's URC-32 HF transceivers.

The ship spent most of that summer going from one Mediterranean port to another, showing the U.S. Navy presence. I was having a heck of a good time!

The USS Wood was an old destroyer and was always having problems of one kind or another. We were usually on "water hours" in the hot summer: since the fresh-water evaporators could barely keep up with the needs of the ship's boilers, never mind supplying daily showers for the crew!

A time came when we were to participate in a big NATO exercise in the eastern Mediterranean and the USS Wood was designated as a "bad guy." Our mission was to shadow the NATO task force, hiding and pretending to be a ship from an enemy navy. When the exercise started, all the other U.S. ships sailed off into the sunset and left us behind.

As luck would have it, at that very moment something went wrong down in the engine room and they "salted the boilers," contaminating the fresh water with sea water. We were dead in the water in a major shipping lane and it was late afternoon. Restoring normal power to the ship was now eight or ten hours away.

This class of destroyers had two emergency generators on board, so we should have had electrical power for navigation lights and communications. However, one generator was down for critical parts (I heard it was a bearing), and the other one wouldn't start! There we were, a U.S. Navy destroyer adrift in a shipping lane with no power, lights, or radios, and no one expecting us to be anywhere soon.

Things started getting a little strange on board. With no ventilation in below-deck spaces and no jobs to do, everyone came up and started hanging around on the weather decks. The reefers were warming up, so cases and cases of ice cream in Dixie cups were being passed up for the crew to eat. It was a race to eat them before everything melted! The empties were tossed over the side, and pretty soon the ship was surrounded by a ten-foot wide belt of floating Dixie cups, paper lids, and little wooden spoons. It was quite a sight.

Well, there was one other vessel in the area that day. It was the ever present Soviet ship that shadowed our fleet for real. The Russian destroyer had initially sailed off with the task force, but they must have been curious about the lone tin can staying behind, because they came back to check us out. At about the same time, someone using the 20-power big-eyes on the flying bridge spotted a big, big freighter on the horizon heading our way, directly at us.

Our signalmen had some battery-powered flashing lanterns and started "talking" in Morse

to the Russians. It was a good thing that we had that language in common! The destroyer circled us a few times, saw the impending doom, and went charging off directly toward the freighter, zigzagging back and forth across her path until someone on the bridge finally changed course to go past us instead of through us! The Russian tin can stayed with us that night until we got our boilers back up.

During the cold-war years a lot of unpleasant things happened between our two navies, but I always think of that Russian destroyer crew guarding us when we were in trouble, regardless of the flags we sailed under.

By Glenn W. Pladsen. Thnx to the *Balanced Modulator*, newsletter of the North Florida Amateur Radio Society, February 1999, from the U.S. Naval Cryptological Veterans Assn., via WB2FGL. Originally printed in the *World Wireless Beacon*.

Anyone else out there have any hamming "war stories"? — ed.

## DNA Conducts Electricity

A pair of Swiss scientists say that it may be possible to grow parts for future high speed computers because of their discovery that DNA is actually an efficient semiconductor. As a result, Hans-Werner Fink and Christian Schoenenberger of the University of Basel say that DNA might someday be used to replace wires in computers, chips, and transistors.

The two scientists have been working on this research for several years. The results of their study suggest that DNA conducts electricity as well as any other known semiconductor. They say that if DNA strands could be genetically engineered with a switch to turn the current flowing through them on and off, they could be used to build extremely tiny electrical devices that are the basic building blocks of computers and other electronic devices.

Thnx to Mir Sholom Science News, via *Newsline*, Bill Pasternak WA6ITF, editor.

## War of the Worlds

Call it life imitating art last year. When a Portuguese radio station decided to repeat Orson Welles' famous *War of the Worlds* broadcast, the results were predictable. Graham Kemp VK4BB of Q-News reported on the Martians taking on Lisbon:

... On Friday, October 30th, radio station Antena 3, in Lisbon, celebrated the 60th anniversary of the Orson Welles radio drama *War of the Worlds* by rebroadcasting it during the morning show.

The original Welles script was used and translated into Portuguese. The station issued a warning at 7 a.m., announcing their intention to broadcast the radio play. But when the play began an hour later at 8 a.m., panic erupted.

The station broadcast the landing of a UFO at Palmela, and the bulletins said that the Martians had set off in the direction of the capital (Lisbon)

and that military forces sent to stop them had proved powerless.

The program's producer said the radio station was inundated with calls from hundreds of panicking people demanding to know what was going on.

The 7 a.m. warning proved worthless because not everyone is listening to the radio that early. Some callers said they had fled their workplaces. Others with health problems complained that their health had deteriorated on news of the Martian invasion.

One of the organizers of the broadcast said, "One hundred years after the invention of the radio, there are still people who will believe anything." ...

All this goes to prove that even sixty years later, some people in radio just never seem to learn.

Tnx and a "run for your life!" to Q-News, courtesy of *Newsline*, Bill Pasternak WA6ITF, editor.

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### Microwave power meters: Operation and testing

Well, we have covered the power meter and its thermistor detector head, the most popular detector used today. There have been many discussions about trying to determine what is the best test equipment for what bargain price. Considering the sheer number of devices out there in surplus, the thermistor RF power head and its associated meter seem to take the top slots for reasonably good buys in surplus when compared with other types of instruments.

Yes, there are other types of meters besides thermistor RF power meters. That's the topic of this month's column, continuing on a few facets of power meters and their attributes.

Most of us have at one time or another come upon a difficult measurement to be made with a power meter. This is usually the case when the readings require the lowest scales of the thermistor power meter to be employed. It seems that at least sometimes the thermistor becomes obstinate about giving up a true reading at these low scale power levels. Usually it's not a big problem, but trouble or questions arise about the accuracy of readings taken when the power level is quite low — say, in the -20 or so dB range.

No matter which manufacturer's thermistor meter you use, they all seem to drift at these low power measurement settings. What is going on and what can be done to improve measurement capability? First, let's see what is most likely to be obtained in surplus.

Most power meters available to the amateur are from Hewlett Packard or General Microwave. It seems that these two workhorses were used in greater quantity (at least in my area of the US) than other types of power meters. In California, I have observed many HP-431 power meters at swapmeets, along with their counterparts, the General Microwave meters. The only thing sticky in picking up a meter is the availability of the critical components, the thermistor power detector head and attaching cable.

Here the General Microwave meters seem to have the edge, as lots of heads came with cables attached permanently. Lots of these RF heads have appeared at swapmeets but it seems that most are defective, having been blown by subjection of the sensitive thermistor power meter head to much greater RF power, thereby smoking the device.

Why you are generally less likely to find a good General Microwave head seems to be related to their sheer size — they are bigger than the HP heads. I don't know what the reason is, but only project a simple answer to support what I have observed. That observation seems to support the HP thermistor head as more prevalent and therefore easier to obtain in surplus. Sure there are indeed defective power meter heads in the HP surplus at swapmeets, so everything still needs to be tested with a simple ohmmeter test to see if it is alive.

The two thermistors should measure about 2 to 3 k ohms and should be matched in resistance between each other to less than 10% difference. The HP power

meter requires them to be matched to balance the bridge circuit internal to the power meter. Most cords required to connect the RF head to the meter have always tested good. Usually the cords are about 3 feet long; while other longer ones exist, they require some special attention for calibration to a power meter normally used with a three foot cord.

OK, now you have received an HP-431 power meter and cable RF head and connected everything all together and have started calibrating the unit. Calibration consists of zeroing the power meter on the zero dB range with the coarse and fine balance control, and then slightly unbalancing with the fine balance control to read slightly up-scale. Switch to the null range and adjust the null capacitor for minimum meter reading. Go back and balance with the fine balance control to zero meter reading, and you're done. Power can be read on any scale.

If you have an HP-432 power meter the procedure is quite similar, except that there is only a coarse meter balance to be adjusted to the zero meter reading. Going to other ranges to make measurements, if the meter is off zero adjust, activate the "set" toggle switch on the meter face and the meter will automatically be adjusted to zero.

Well, not so, you say, having done this several times, waited, and still seen the meter seem to climb up-scale in meter readings while you just sat there with no RF applied. What is going on? Do I have a drift, defective meter? That's the topic of this month's column, to answer questions sent in by readers about their power meters and about just this exact scenario of drifting power meter readings, especially on the lower power meter ranges.

The analysis is such that the meter behaves at the zero dB range and slightly poorer on the minus 10 dB range and gets even worse on the minus 20 dBm range. Well, is this a defective meter to be replaced? What is

going on to make the meter so unstable? Let's look into the meter's operation and see how the thermistors allow RF power to be measured and displayed on the analog meter of the power meter.

Thermistors are heat sensitive devices and, as the name implies, are actually temperature controlled resistors. In other words, they respond to minute changes in temperature to cause a bridge circuit to be upset. This upset or imbalance caused by components changing their resistance is how the power meter works. The thermistor is in one leg of a bridge balance circuit and the meter is in the other leg. When one leg unbalances, it causes the other leg to react. The change is indicated on the analog meter and shows how unbalanced it is. The more the power that is applied to one side, the more the meter swing on the other bridge lead and thus the indication of more RF power as a whole test set.

In practice, RF is applied to one thermistor while the second thermistor in the power meter head (not exposed to RF heating) is supposed to balance external heating effects (room temperature changes) to develop a true RF power reading. The second thermistor is used to stabilize small temperature changes to make RF readings more accurate.

On the upper meter scales, this is quite true and very sensitive. But when you go to the lower limits, the thermistors are not able to control minor temperature changes and retain a zero meter reading. If you don't believe me, calibrate the meter and set it to the minus 20 dB range on zero and touch the RF head with your (warm) hand. The meter will go steadily up-scale as the thermistors change their resistance, reacting to the temperature change from your hand. It's not RF, but body heat.

Simple drafts of air in a garage or home environment will do the same thing with slightly longer time constants. How, then, do you make low power

meter readings that are accurate? Well, calibrate your meter and take a quick measurement, then terminate the test and see how much the meter is now uncalibrated — then make a quicker test or make a judgment call on the results.

Can the measurement be made with better accuracy? You bet it can, but not with standard thermistor mount devices. The power meter principle can be used, but the method is changed. What you do is remove the thermistor-type meter from very low power measurements and replace it with a crystal detector-type power meter.

In my shack, I have an old surplus Pacific Measurements crystal detector power meter. So far this is the only crystal detector power meter that I have seen for a reasonable price on the surplus market. Sure, I have seen others offered for sale, but I was not willing to pay the asking price. Maybe I was lucky in that a local surplus dealer had this meter and it came with the detector attached. Not only was the price reasonable, but testing the meter showed that it seemed to be functional. A little contact cleaner sprayed into the pots and switches for better electrical contacts reclaimed a very effective meter.

This meter has a particular quirk in that it requires a warm-up for internal circuitry of about 2 to 5 minutes, during which time it's useless to try to use the meter — it just wants to self-balance or go through some process that I am not familiar with (I do not have a manual). After this period of time, the crystal detector can be attached to an onboard 30 MHz RF very accurate test source at zero dBm for meter calibration. This source is also switchable to minus 20 dBm to balance the meter using these two test levels.

After that, the meter is accurate down to nearly minus 70 dBm and does not drift even when handled (body heat), as heat does not affect the results of the power meter head. Why? Because this responds to detected RF being rectified in the diode and its reading presented to the

meter's sensitive circuitry. RF in this case does not heat the thermistor to change its resistance. The diode detector meter produces so much of an improvement in dynamic range that I can use the meter to evaluate filters and other devices requiring very low levels. Things like a filter that is not in adjustment exhibit very high loss and, even when driven with a +10 dBm from a signal generator, losses can exceed 50 dB when out of resonance.

The crystal detector seems to be quite an improvement over thermistors. The Pacific Measurements power meter with diode detector has made a great impression on me in many ways. First, by extending lower sensitivity better than 30 dB over that which can be obtained with the thermistor mounts. Second, the frequency response is greatly improved and seems to be quite a wide range, from 10 MHz or so to 18 GHz. Tests at 24 GHz are unconfirmed, as I have nothing to verify them with, but it still sees 24 GHz energy and gives me a reading that seems somewhat down in level but still very workable. (I do not have any 24 GHz source that can be used to verify results at this frequency.)

Have I gone overboard to the point at which I use only the crystal detector RF power meter? No, for several reasons. The HP-432 power meter is the workhorse meter in my shack and will remain so for quite some time. It is sensitive for most all work repairs and adjustments made on my bench, and if for some reason it goes kaput I have spare meters and power meter heads in order to quickly get back into the business at hand. I would cry losing an HP power meter head, but there are spares.

With regard to the Pacific Measurements crystal power meter, I would *really* cry if I blew this unit up. I do not have spare crystal detector heads. The other stuff comprising the power meter circuitry can be repaired, as it is discrete circuitry. It would not be easy, but it is possible to repair most all of it.

While some components might be special, almost all the parts can be obtained. So my main advice is to protect the power meter crystal detector from all accidental overloads; in other words, reserve it for tests that cannot damage the crystal detector. If you must, use attenuators to protect the meter at all costs.

That's the main reason I reserve the crystal detector for low level tests rather than use a 30 dB attenuator and measure 10 watts of power from a TWT amplifier. Should the attenuator let go and go bad, there goes the crystal detector and the power meter, without a repair part. Should the HP power meter be subjected to the same scenario of destruction at high meltdown proportions (the TWT amplifier), there are spare power meter heads available in my shack. I would recommend the same to you should you have the opportunity of acquiring spare equipment for "that day."

My recommendations made concerning diode detector power meter heads would seem to extend to products from other manufacturers of power meters, not just the one I happen to have in my shack. The Pacific Measurements crystal power meter was picked up through surplus, and as such just happened to be the first one of its type I was able to locate.

The winds of surplus blow hot and cold for all kinds of instruments. I hope you are able to take advantage of using a crystal detector power meter, with its greater dynamic measurement range in comparison with conventional thermistor power meters.

Well, that's it for this month. If you have any questions on this month's topic or related subjects, please feel free to drop me a line (please send an SASE), or still better yet, send me an E-mail note for a fast response at [clhough@pacbell.net]. 73, Chuck WB6IGP.

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## Amateur Radio Via Satellites

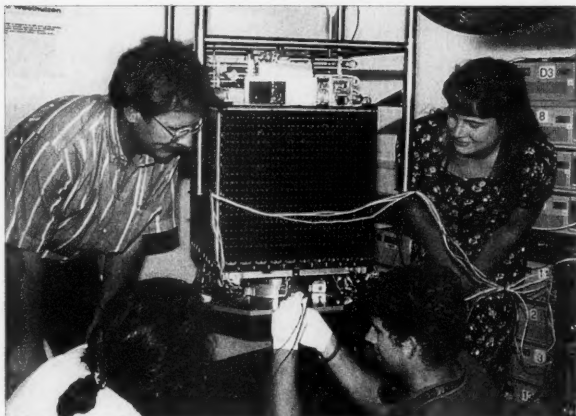
Andy MacAllister W5ACM  
14714 Knights Way Drive  
Houston TX 77083

On February 23, 1999, at 2:29 a.m. Pacific Standard time, a Boeing Delta II rocket flawlessly lifted three satellites into a 450-nautical-mile-high orbit from Vandenberg Air Force Base. The primary payload was the 6,000-pound P91-1 Advanced Research and Global Observation Satellite (ARGOS) for the U.S. Air Force. Secondary payloads included the Orsted satellite for Denmark and SUNSAT-1 for South Africa. The launch was originally scheduled for early January, but weather and mechanical problems caused at least 10 delays.

### The Delta II launcher

Amateur-radio satellites have a long history with flights from Vandenberg and Delta rockets. OSCAR-1 (Orbiting Satellite Carrying Amateur Radio) was the first hamsat to reach orbit from Vandenberg. The rocket was a Thor Agena and the date was December 12, 1961. Australis-OSCAR-5 was the first hamsat on a Delta rocket. Launch was from Vandenberg on January 23, 1970.

While most recent hamsats have been carried to orbit on Ariane vehicles, SUNSAT-1



**Photo B.** SUNSAT and some of the crew at the University of Stellenbosch in South Africa. (This and succeeding photos courtesy of SA AMSAT.)

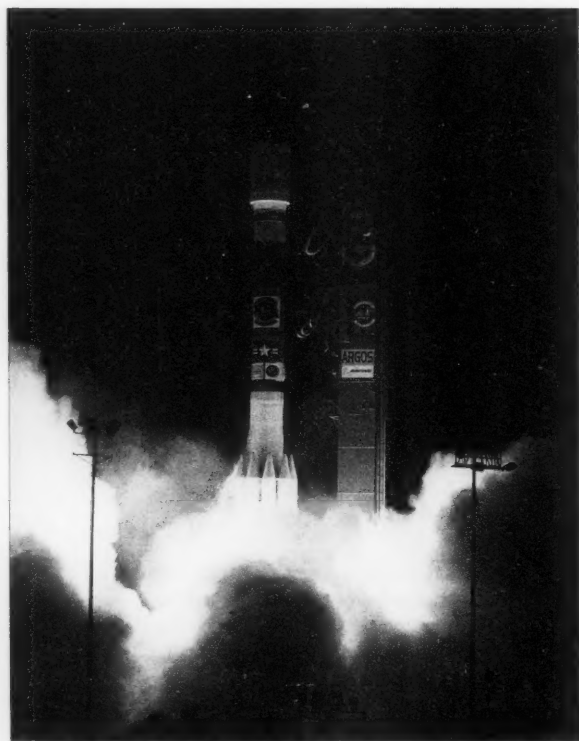
(now known as SUNSAT-OSCAR-35), Orsted, and ARGOS rode a Boeing Delta II 7920-10. It is the current standard for a medium capacity expendable launch vehicle. The basic structure is manufactured in Huntington Beach, California. The engine is an RS-27A built by the Rocketdyne Division of Boeing in Canoga Park, California. This engine uses a combination of liquid oxygen and RP-1 (kerosene), and has a liftoff thrust of 200,000 foot pounds. Final assembly for Delta rockets is in Pueblo, Colorado. The Delta launch team at Vandenberg AFB handles launch coordination and operations.

### ARGOS

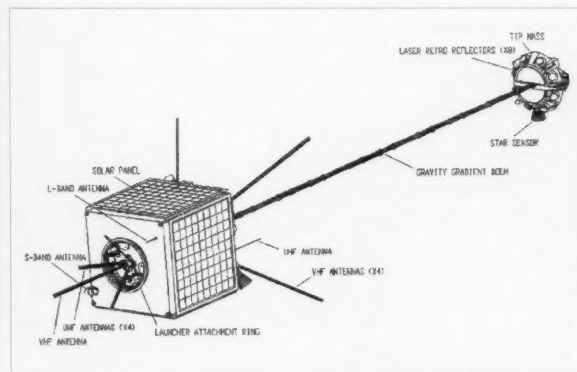
At three tons, the ARGOS satellite carries nine separate

subsystems to demonstrate future satellite technology and conduct various high-technology experiments. As the primary contractor, Boeing integrated the sub-payloads and developed the overall design. The solar-cell panels deliver 2200 watts of power and the data transfer rate from the satellite to Earth can run up to five megabits per second, more than twice that of current comparable satellites.

The nine major experiments onboard ARGOS address more than 30 research objectives, including sensor technology tests for the International Space Station (ISS), three ultraviolet imaging experiments, and an X-ray sensor system to observe X-ray pulsars. Other devices include a high-temperature super-conducting

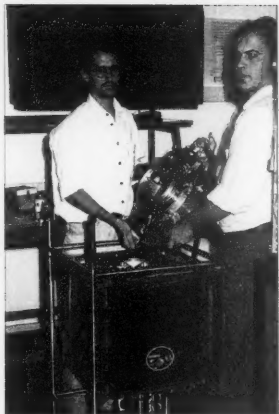


**Photo A.** SUNSAT-OSCAR-35 (SO-35) headed for orbit from Vandenberg AFB with ARGOS (USAF) and Orsted (Denmark) onboard a Boeing Delta II rocket on February 23, 1999. (Thom Baur photo via Boeing.)



**Fig. 1.** SUNSAT 1 (SUNSAT-OSCAR-35) in its operational configuration with gravity gradient boom deployed. (This and other figures courtesy of SA AMSAT.)





**Photo C.** Dirk Merwe and Kobus Westhuizen installing the Payload Adapter Assembly (PAA) on SUNDAT.

experiment, an arc-jet thruster rocket and a Global Positioning System (GPS) receiver. ARGOS has a three-year design life.

## ORSTED

Both Orsted and SO-35 are very small satellites compared with ARGOS. Each weighs just a bit more than 100 pounds. They were mounted below and to the sides of the ARGOS Payload Attach Fitting and released from the second stage booster about 50 minutes after ARGOS.



**Photo D.** In the lab at the University of Stellenbosch, SUNDAT gets a fit check with the Payload Adapter Assembly (PAA) and associated hardware.

Orsted was designed to study the generation of Earth's magnetic and electrical fields. NASA-supplied components include a GPS receiver and a magnetometer. The satellite is appropriately named after Hans Christian Oersted (1777-1851). He was a professor of physics at the University of Copenhagen. Nearly 180 years ago, he was the first to note that a compass needle is deflected when a current is applied to a nearby wire.

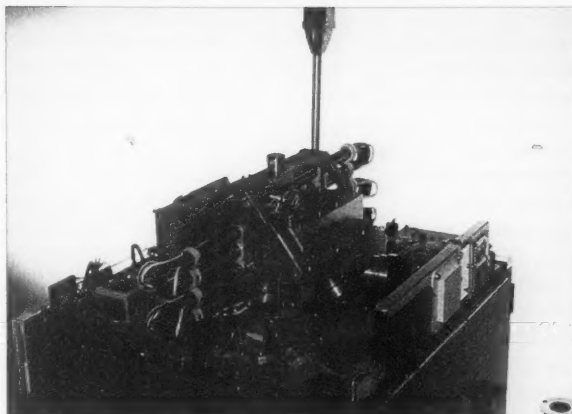
## SUNDAT beginnings

In 1989, at a conference hosted by the University of Stellenbosch in South Africa, a proposal was made to build and launch a satellite. The suggested program name was KLEINSAT (*klein* is the Afrikaans word for small). After nearly a year and a half of work defining the program and attracting industry sponsors, an advisory board was set up and an official program began under the name SUNDAT in June, 1991.

Prof. Garth Milne ZR1AFH was named as Project Leader and Hans van de Groenendaal ZS5AKV, representing AMSAT-SA (The Radio Amateur Satellite Corporation of South Africa) and the South African Radio League, was named to the advisory board. The name SUNDAT is derived from Stellenbosch UNiversity SATellite. Partners in the program include Alcatel Altech Telecoms, Siemens and Plessey SA and the Foundation for Research and Development.

## The primary payload

The SUNDAT program defined the satellite's primary payload as a low-cost, high-resolution imaging system to take photographs of South Africa. The goal is to analyze the spectral content of images sent from SUNDAT to determine the type and density of ground vegetation. The University of Stellenbosch worked with the South African Council for Sci-



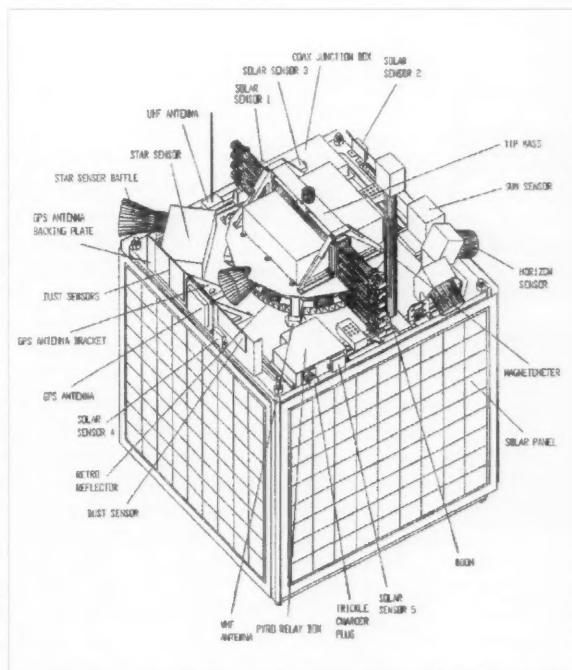
**Photo E.** A top view of the SUNDAT spacecraft reveals several devices and instruments, including a star camera (front center), a white GPS patch antenna (right), and the tubular sections of an 8-foot-long gravity gradient boom in its pre-release state (center).

entific and Industrial Research to develop a three-color (green, red, and infrared) camera system that has a resolution of about 50 feet from an altitude of 450 miles. A similar camera is in development for use on the hamsat KITSAT-3 from South Korea.

## Other experiments

Several experiments were

designed for inclusion in the SUNDAT spaceframe. They include a satellite sound and temperature device from the George Campbell Technical High School in Durban, South Africa; a radiation damage sensing experiment from the Rhenish Girls High School in Stellenbosch; a dust particle detection unit from the Cape Town Peninsula Technicon; a material exposure



**Fig. 2.** View of the instrumentation on the zenith-pointing face of SUNDAT I.



experiment from the Materials Science Department of the University of Kebangsaan in Malaysia; a TV camera with S-band (13-cm) downlink; and two NASA devices.

NASA provided a GPS Turbo-Rogue receiver and a satellite laser tracking retro reflector. The laser reflector system can be used to determine the exact distance (millimeter accuracy) from a ground tracking station using a high-power laser to the satellite by measuring the transit time for the light beam.

### The ham gear

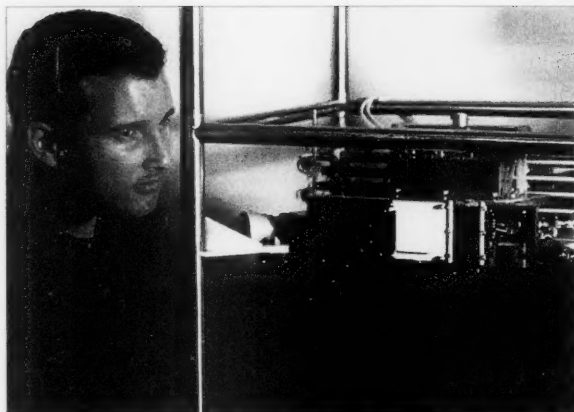
SO-35 carries a number of systems of interest to radio amateurs. The basic gear includes a two-meter FM parrot repeater on 145.825 MHz, and a digital store-and-forward packet package capable of 1200 or 9600 baud operation, along with other FM transponder possibilities.

The parrot repeater listens for

eight seconds and then transmits what it has heard and recorded during the next eight-second cycle. The operation is repeated as long as the unit is activated. This rudimentary system was developed to allow very simple ground stations access to the satellite. It is hoped that school ham stations will be able to easily use this resource to promote space science education.

SO-35 downlink frequencies include 145.825, 436.300, and 436.250 MHz. During the first days after launch, the 436.250 MHz frequency was used for 1200-baud telemetry downlink.

Due to the flexibility of the system, nearby frequencies can be programmed into the satellite in 12.5 kHz increments. Power output for the downlinks can be set to one or four watts on two meters and 1.5 or 10 watts on 70 cm. The low power settings will be in effect over most of the world, while the high-power settings will be used



**Photo F. Zaahied Cassim of the Peninsula Technicon checks out his particle impact detectors on SUNSAT.**

when the satellite is over Africa. Amateur radio operators and school groups will need to request high-power operation over their areas for specific experiments or events. E-mail to [hans@intekom.co.za] should work.

SO-35's FM uplinks are also programmable for 12.5 kHz steps, but the primary frequencies include 145.825, 145.850, 145.900, 145.950, 436.300, and 436.250 MHz.

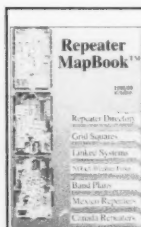
On March 14th, just a few weeks after launch, Garth ZR1AFH in Stellenbosch and Hans ZS5AKV in Hillcrest made a voice contact via SO-35. This was an exciting moment for both, since they had been working to get SUNSAT built and into orbit for nearly a decade.

For their historic contact, the satellite was configured for analog FM input on two meters and output on 70 cm, similar to the FM-repeater mode that is enjoyed by many on AMRAD-OSCAR-27. Now that SO-35 is in orbit and operational, the SUNSAT advisory committee will work to finalize a schedule for the satellite's experiments and communications systems.

### What's next

Nearly 50 students at the University of Stellenbosch have earned their Master of Electrical Engineering Degrees as a result of working on the SUNSAT project. Efforts are already underway to continue the SUN-

*Continued on page 45*



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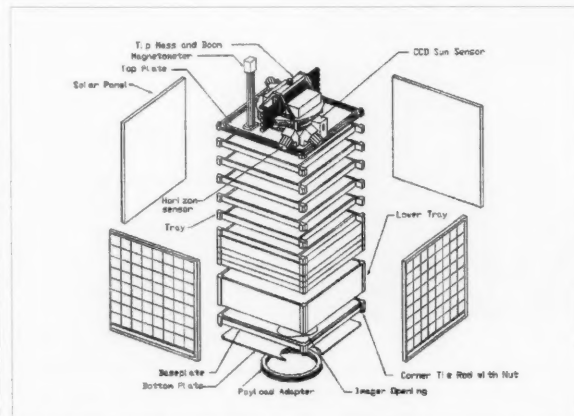


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**Fig. 3. Exploded view of the structural configuration of SUNSAT I (SO-35).**

# HOMING IN

## Radio Direction Finding

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### Grungebusters

When I first got my ham license as a pre-teen baby-boomer, just about the only sources of RF in my town of 12,000 souls were one AM radio station, a dozen ham operators, and a growing number of CBers. Oh, yes: The police and fire departments had a few radios, too. At an ever-increasing rate, others discovered the usefulness of radio communications — others such as the Post Office, security companies, and utility fleet dispatchers. Then came paging, cell phones, trunked radio systems, medical telemetry, Family Radio Service, and so on.

Nowadays, the ether is full of voice, data, images, telecommands, position reports, and alarms. It seems as if some new use for the spectrum is announced every day. And then there are the devices that aren't supposed to radiate RF, but do, such as computers, arcing doorbell transformers, fish tank heaters, and even light bulbs.

If you haven't experienced interference to your ham operations from one of these sources, you're really lucky. You can't expect your luck to last. The more you know about radio direction finding (RDF) techniques, the

faster you'll be able to solve the problems when they occur.

### RACES to the rescue

County of Orange RACES in California has more than its share of good transmitter hunters with lots of experience. One of them is Chief Radio Officer Ray Grimes W6RYS. As a Senior Staff Engineer for Motorola, he is often called upon to identify interference to his company's communications products and systems.

"I troubleshoot problems that are high visibility," Ray told me. "If we've got a big police department with communications trouble, or if a big utility comes to Motorola needing help, or if it's a life-threatening matter because a radio system is compromised, I get the call. The company has been very good at letting me deal with things like this. On rare occasions I have been pulled off to places like New York."

What gear does a professional QRM-tracker use?

"I have an IFR service monitor and spectrum analyzer that I carry along," W6RYS explained. "It fits under an airline seat and can demodulate most modes, so I take it everywhere. I also have a couple of high-

quality scanners, handhelds and yagis, and some other tricks. I've found a lot of sources in tight areas without a directional antenna, just by using a whip and tightening the squelch. We had to chase some interference in Terminal 1 of Los Angeles Airport on the day after Thanksgiving, starting with the yagis, analyzers and other big stuff. I suddenly realized that we looked too much like the bomb squad and people were starting to notice. So I went out at lunch and bought an inexpensive scanner with a rubber whip. That was enough to eventually sniff out the interference.

"I have a good working relationship with Jim Zoulek and the other Los Angeles FCC folks. They have been very responsive when I need access somewhere. Occasionally, they have helped with RDF. They look up file histories and frequencies for us, but much of the time the emitters are unlicensed and nobody is responsible for them. Look where computers are going, their clocks are getting close to 400 MHz. I've seen interference from laptops tearing up 800 MHz radios. Cable TV channel frequencies are getting higher and leakage is worsening as cable systems get older. Wireless LANs are tearing up the 800 MHz band."

Many times, the offending transmitters are either fully licensed or operating legally within FCC Part 15 specifications. Ray continued, "A number of years ago, we had a security system on high band at a racetrack that was being ripped up by some big AC-modulated carrier. It took us about a half day to find it at a hospital a quarter mile away. Because I got a cop to come over, the hospital's person in charge was very interested.

"He took us up to an ICU ward, where we tracked it to the door of one patient's room. Its window faced the racetrack. Because there was an isolation sign on the door, the nurse went in by herself. She came out

holding a medical monitor transmitter in her gloved hands. I asked her to take the battery out of it. She did and the problem went away. Out of curiosity, I asked what the patient was in for. She looked at the chart and said, 'AIDS and hepatitis.' We all immediately took six steps backwards."

### Harbor high jinks

In his off hours, Ray works with other OCRACES members to solve QRM problems that have much less visibility, but are just as troublesome to those affected by them. Last fall, these grungebusters needed everything in their bag of tricks to find the source of an interference problem at the Harbor Patrol station in Newport Beach. A strong, continuous signal was present on two important communications frequencies near 45 MHz.

The signal had a strong 60 Hz buzz to it. To them, it sounded like a video carrier. It was also rather unstable in frequency, occupying a 2 MHz swath of spectrum. Harbor Patrol radios do not use subaudible tone squelch, so the interference kept the receivers unquieted and covered many incoming signals.

W6RYS was first to drive around the harbor vicinity to do some basic listening on a weekday. Early on, he found what appeared to be a stronger version of the interference a few miles northwest, near a large 355-bed hospital. Based on that report, the hospital became the first suspect.

Robert Barris KD6IFZ (OCRACES Direction Finding Coordinator) and Jim Carter WB6HAG each passed through the Newport Harbor area several times on the following weekend, using scanners and other receivers to try to pick up either signal. No luck — The interference was not audible. Where did it go? Perhaps the interference was from a device that only operated during the week. That reinforced the hospital hypothesis.

All this was dispelled by a visit on Monday to the Harbor

### HAMSATS

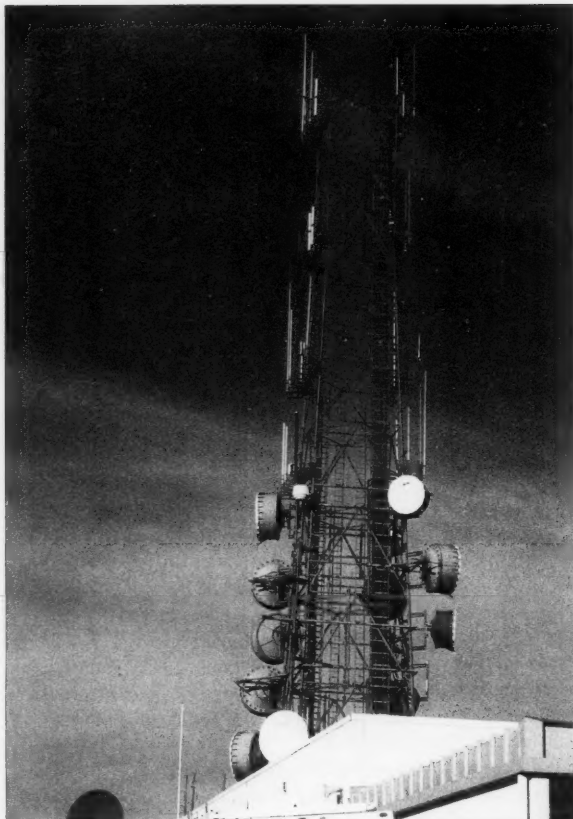
continued from page 44

SAT program with SUNSAT-2 and beyond.

You can find out more about SO-35 via the following Internet Web sites: [http://www.amsat.org] and [http://sunsat.ee.sun.

ac.za]. In addition to timely updates on SO-35, both sites offer a number of excellent links to related hamsat pages. The SUNSAT page also provides links to the P91-1 ARGOS, Orsted and SUNSAT media kit from Boeing.

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**Photo A.** Transmitters everywhere! With all the communications sites like this one, plus RF-emitting devices in almost every home and business, it's no wonder that unintentional interference is a growing problem.

Patrol building, at which time W6RYS and KD6IFZ were informed that the noise had been nonstop all weekend. "As it turned out," Robert commented, "this should have been an excellent clue that the noise source was either close to the station or inside it, but like many such observations, it only became obvious later."

All three hunters spent a fair amount of time that afternoon both inside and outside the Harbor Patrol building, trying to further characterize the signal, determine if the source was inside or outside, and find out if switching off any particular piece of equipment affected the offending signal.

Trying to nail down a signal source inside an active communications center can be very challenging. Using scanners, a spectrum analyzer, a Tektronix

scope and a variety of hand-held radios and attenuators, the OCRACES RDF team went through many possibilities and turned off a lot of equipment, yet the problem persisted. The assortment of digital and radio gear in the room that also radiated noise in the same part of the spectrum made it impossible to home in on the problem signal. Every piece of wire seemed to be awash in this wideband 45 MHz RF.

The scope showed very peculiar modulation. While there was clearly a 60 Hz component to it that was audible, the signal also contained very high frequency "spiky" energy and asymmetry of modulation. Was it video? Corrupted AC power? Computer noise?

The team next went outside to have a listen in the area surrounding the antenna tower.

Atop the garage adjoining the main building, Ray and Robert had no problem picking up the signal on their hand-held radios. That made them suspect that the signal source was outdoors, but there was still the possibility that it was inside the building and radiating out through the coax feeds going up to the tower next to the garage.

Further sniffing led them to the other end of the building, where the signal was stronger. There on the rooftop was a long run of coax connected to a dockside security camera. Video, 60 Hz, long cable run near the antenna tower — it all seemed to make perfect sense. They asked when the camera had been installed, and were told a month ago, which correlated with the start of the reported interference. With big grins on their faces, they asked for the camera to be turned off. Their grins vanished just as quickly when the noise persisted on the console radios.

The team mulled over the idea of powering down the whole building for a few seconds to make a fast "inside or outside" determination, but this was rejected as impractical. In hindsight, considering how well the signal propagated through all the cabling, it might not have yielded the right answer anyway.

Then came the news that would add a few more hours in the hot sun. Another Harbor Patrol station down the coast reported hearing the same kind of interference. Aha! The source had to be fairly strong and located somewhere that could reach both Newport Beach and Dana Point!

With radios, maps, and a 45 MHz whip on the trunk lid, W6RYS and KD6IFZ set off on the biggest wild goose chase of the day. After a complete round trip on Pacific Coast Highway to Dana Point and back, they realized that the Dana Point report had been a red herring. Whatever the Dana Point station heard might have had a 60 Hz buzz to it, but there was

certainly no signal source between the two sites that could be the culprit. And the second station had nowhere near the QRM level that Newport Beach did.

Now it was getting late in the day and the team needed some results fast. Returning to the Newport Harbor station, they went back to the "nearby signal source" hypothesis. To try to get a better handle on the behavior of the signal, they connected the IFR spectrum analyzer directly to the 45 MHz whip antenna. With Ray driving and Robert keeping the IFR from tipping over in the front seat, they canvassed the area immediately surrounding the station.

There were plenty of distinct signals from 39 to 50 MHz with all the hallmarks of the interference source, such as 60 Hz buzz, wideband, steady strength. Uphill from the harbor station, one residence seemed to have the highest radiated strength of all the emissions in the 45 MHz region. Upon contacting the occupant and making introductions, a sweep of the home was conducted, zeroing in on a new digital cable box. It was giving off the 45.674 MHz signal that the team had picked up with the analyzer in the street.

This signal was coming from every run of coax from the sidewalk all the way through the house. The resident indicated that he had used this new digital cable service for about a month, roughly coincident with the onset of noise at the harbor station. Considering that active attenuation was needed in the last 20 feet of sniffing to the cable box, with about 50 dB of attenuation, it seemed clear that this was a red hot suspect.

The RDF team began to believe that either this residence or the entire cable TV system in the area could be responsible for the QRM. It was conjectured that digital cable signals might indeed carry the distinctive 60 Hz buzz due to video's frame rate, and yet not resemble conventional video modulation because of the digital encoding.



## Mobile, Portable and Emergency Operation

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### Y2K thoughts

Although the people in high technology have been anticipating the effects of the Y2K bug for over a decade, it now is the stuff of which headlines are made. Everyone seems to be aware that some computers will misinterpret the date after December 31, 1999, to be January 1, 2000, rather than the year 2000. Some companies have undertaken massive efforts to correct this problem, while others have pushed the problem behind other more interesting projects.

In case you've been on a DXpedition for the last year, this problem is due to the fact that back in the days when computer memory was extremely expensive, one of the goals of writing computer code was to abbreviate wherever possible. For this reason, years were encoded as two digits only. At the time, programmers never expected that the programs they wrote in the '60s (make that the 1960s) would be around at the turn of

the century. Not only are the programs still around, but they have been translated from one computer language to others. Even if the original source code still existed (and it usually doesn't), it would be almost impossible to rewrite. With the original code lost, it is an even bigger challenge.

The problem is complicated by the fact that some computer programs, even if corrected, can be corrupted by interaction with programs that have not been corrected. There are also many "embedded" chips, which are the computer chips that are part of many appliances, automobiles, etc. While many do not track years, and won't be affected, others do and will. Some feel that the embedded chips in the power grid that controls our household electric power may create a problem. There may also be problems with microcomputers controlling traffic signals and some aspects of the communications system.

In any case, there is truly a bipolar reaction to the expected

event. Some people expect no problems, while others have developed a fear level that is difficult to explain. To some, this rivals or exceeds the fear of nuclear war in the 1950s. Just as a small cadre of people at that time built fallout shelters and stocked them with food and supplies and predicted dire consequences, some today have taken a similar position. Generators are being sold at a record rate. I'll bet that very few people who have purchased generators have calculated how much fuel they'll need to purchase, store and treat with preservatives in order to operate the generator for more than a few hours. People are stashing away food such as MREs. Those of us who have had the privilege of existing on these know that the initials are often assigned to words much less complimentary than "meal: ready to eat." I recently heard on the news that the companies which make wood stoves for the Amish have been sold out for quite some time. The same story mentioned an individual who purchased a ton of wheat. I wonder if he or she has figured out what to do with a ton of dry wheat.

Where on the continuum between normalcy and pandemonium will the event lie? No one knows. I believe that it is prudent to prepare for the event, but to do so in a realistic manner. I respect fire, but do not have an

unreasonable fear. I own smoke detectors and fire extinguishers although I do not panic at the sight of fire. Like fire, I respect the potential for unexpected occurrence. I expect that between today and December 31, 1999, there will be at least one potential emergency event such as a severe storm, brush fires or a search and rescue requirement that will impact me personally. I also plan on some inconveniences when the clock turns past midnight next New Year's Eve. This column can act as a forum for ideas over the next few months to discuss and review the possible implications of the Y2K eventuality and how to deal with them. Maybe like the long awaited appearance of Halley's Comet it will be a mild event, but then again it may be significant.

What are the priorities that we should set? I believe in XYs and harmonics first (that's women and children first, for you new to the hobby). The first concern each of us must have is for our families. There are a number of basic issues that can be handled easily. The first rule of survival is for water. Water can be easily stored in gallon containers such as milk jugs. Water stored in late December should be potable just in case the water treatment facility in your area experiences difficulty.

*Continued on page 50*

The next day, Howard Newton N6WOW went to the scene and performed a far more thorough on-foot sniffing expedition, covering both the immediate area of the Harbor Patrol building as well as dockside. There he discovered a battery charger connected to a jet ski, covered by a tarp. At close range, the 45 MHz interference was incredibly strong. Could it be that simple?

Yes, it vanished the instant the charger was unplugged. The owner indicated that he "plumb

forgot" about that charger under there. With that simple step, the Harbor Patrol radios were interference-free once again.

As KD6IFZ told me on the phone afterwards, "It was like any other difficult transmitter hunt. You rack your brain all along, but once you find out what it is, everything suddenly makes sense."

Thanks to Robert, Ray, Jim, Howard and the other T-hunters of Orange County RACES for this story, which was originally detailed by KD6IFZ in *NetControl*, the organization's monthly newsletter.

### Another kind of snooping

There was a lot of reader interest in the new system for automatically surveying in-car radio listening that I described in "Homing In" for July 1998. Some were excited. ("Can I get a job there?") Others thought it to be a bit snoopy. ("Cookies for radio?")

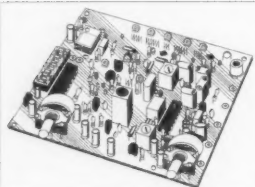
No worries. The roadside radio detectors compute how many drivers are listening to Rush talk and how many are singing along with Garth, but they make no distinction as to which car is tuned to which star.

The system, called Mobil-Trak, is now operational in Toronto, Phoenix, and some areas of the Los Angeles metropolis. Installation is progressing in a dozen other places, including Miami, Seattle, Kansas City, Nashville, Minneapolis and Pittsburgh. You can read more about it on the Web, following a link you will find at the Homing In site. My site also has the latest on the 1999 ARDF Championships and the Burrowing Owl Project, so check it out if you haven't surfed by for a while.

73



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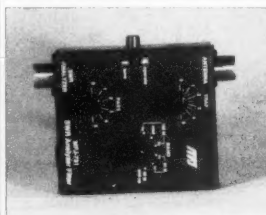


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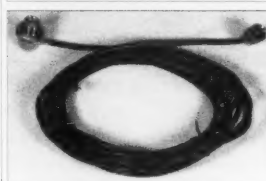
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## Low Power Operation

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Most of us like to build our own gear. If you happen to enjoy designing radios, then you more than likely have laid out your own PC boards. In the past, I've used just about every method I came upon. Without a doubt, the easiest way to lay out a PC board is with a computer. But, if the board is a simple one, you can still use one of these methods.

Several months ago, we talked about using mailing labels and marking pens. They're OK if you only want one board. If you want to make more than one PC board at a time, then you must use the photo etching method. In a nutshell, you make a negative (or positive depending on your chemistry being used) and expose the negative to a photosensitive board. When the photosensitive coating is exposed to UV light, and then developed, it turns in a rather tough resist.

There are a few steps needed to produce a PC board using the photo resist method. The first one is generating the artwork. Years ago, and I do mean years ago, you could make your own artwork using a product called

"Bishop graphics." Basically, they were stamped out black crepe paper with a sticky side. You applied the graphic you wanted, say a 14-pin DIP, onto a sheet of Mylar. You then connected the various pads and pins using the tape strips. You assembled your PC board by cutting and placing all the pads, IC pins and other mounts as needed. You could get the Bishop graphics in all sorts of different outlines. They came in 0.300 spacing DIP outlines, TO-92, TO-220 transistor outlines, as well as just about anything you could think of. When you were done with the artwork, you had a graphics house produce a one-to-one negative. This negative was then used to "burn the board."

The actual process varies from chemistry to chemistry, but the basic idea is as follows.

You mounted the photosensitive board in a frame. This frame consisted of a sheet of glass and some clamps. The one I had was homemade and reminded me of a book. One edge was on a hinge. You opened up the frame, put in the board and then the

negative. You closed the frame and the sponge backing kept everything tight. You then exposed the board to a source of UV light. I used a UV sunlight lamp. These were also called tanning lamps. Kind of expensive, and somewhat hard to obtain. Depending on the chemistry, it took from one minute to 15 minutes under the UV light. After the exposure time was up, you developed the board. At this time, you can clearly see the photo resist on the copper board. The board is then etched in your favorite chemical. The rest of the process is the same as any other PC board application: drilling holes, stuffing the board and then troubleshooting why it won't work when you're done. This is the biggest drawback using the Bishop graphics. If you have made a goof, you must redo the entire process from step one. And unless you have a darkroom for making your own negatives, it can start getting expensive. Then there is the cost of the Bishop graphics themselves. They're not cheap and they can only be used once.

I did find one really slick way of making a PC board using Bishop graphics and the artwork from a magazine. If you place the Mylar sheet over the top of the artwork in a magazine, you can trace out the layout with the Bishop graphics. It's very time consuming, but if the board is simple, you can make an exact copy of the board from the magazine!

Later on, the popular transfer film allowed you to make a copy of a magazine page with a plain paper copier and then iron the result onto the copper board. Now, you know, I have never been able to get that to work for me! Try as I may, I never got a usable PC board from the ironing board.

I mentioned several times about the chemistry used. You could get either a positive acting or negative acting chemistry. By far the most popular is the negative acting chemistry. If you used the negative chemistry, you needed a negative to produce a board. This required one more step, and usually a trip to the local graphics house to produce the negative.

You could get positive acting chemistry. As the name implies, you only needed to produce a positive image that would be used to produce your PC board. By eliminating one step in the process, you reduced the time needed to make a board. And, you did not have to become friends with the guy at the graphics house. On the other hand, the positive acting chemistry was a bit harder to work with. And to make matters even more hairy, positive acting chemistry cost about fifty percent more than the negative acting chemistry.

That leaves us with the best of PC board layout. That's using a computer. My first attempt at a computer-designed PC board was with a program called

## ON THE GO

continued from page 47

Don't forget that they are dependent upon electrical power to function. Plan on 3 gallons of water per person per day for drinking purposes.

Next is food. Canned food that does not require heating is a relatively easy solution, but don't forget that you'll need to have a can opener that doesn't require electricity. Cold pork and beans may not be the gour-

met dish you crave, but it will meet your daily caloric intake. If you have a grill with a side burner you can heat the canned foods, but make sure your tank is full and you have at least one spare. (And don't run your grill inside, of course.)

If you take prescription drugs, lay in a month's supply. If the pharmacy's computer has a problem, refills may not be available. Finally, if you don't live in the sunny South, heat may be an issue. A fireplace is

of no real benefit if you lack firewood.

Finally there is communications. The first issue is to be able to receive communications about what is happening in the rest of the world. A simple transistor radio with a supply of batteries or an alternative power source will fill this need nicely. Second is the ability to communicate with others. That will be the basis of the next column.

Am I preparing? Yes. Am I

worried? Not really. We're hams, after all, and have dealt with tornadoes, floods, blizzards, hurricanes and every other surprise that nature has thrown at us. I don't think a computer bug can compare with what Mother Nature can throw our way.

Let's use this column as a clearinghouse for information you think is important for the Y2K experience. Send your ideas to the E-mail address at the top of the column or by snail-mail to my home.

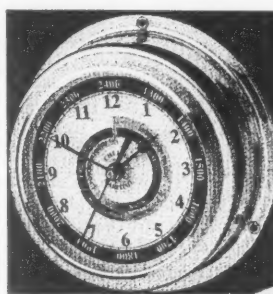
"Smartwork." It was a very expensive program at the time, about \$1200 for the basic package, and worked only on the IBM XT computer. That's how far back it was! This program produced a one-to-one or two-to-one output that you printed on a dot matrix printer. You took this artwork to the graphics house to produce a negative. You processed the PC board in the usual way after you "burned" the board. However, this time if you made a mistake, you could easily fix the screwup on the computer. Of course, you still had to make a new negative and once again burn the board. But the entire process was speeded up. You could move a pad or a line in a matter of seconds instead of hours using the old Bishop graphics.

That was then. This is now. Today, there are many programs that allow you to make a PC board from your computer. You can get software for the Wintel

machines as well as the Apple Macintosh computer. And even though all the programs allow you to generate a printed output, now you can produce a color printout thanks to the low cost of the inkjet printers.

And if you don't want to make a negative and burn your own board, you can produce the Gerber files and have someone else make your boards. Having the capacity to make the Gerber files and the NC drill files yourself, you simply upload them to a board house. In a few days, PC boards! Now, you don't get this for nothing, and the process can be expensive, but if you need double-sided PC boards with plated-through holes in two days, it's the only game in town.

Of course, if you wanted to make your own negative, a quick click of the mouse would produce a laser printout of your board. You could then burn your board and process it as usual.



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Right now, the only game in town for PC board layout is a computer. There are dozens of programs that perform this function. Next time, we will look at laying out a PC board

using a computer. I'll also have some names and addresses for PC board houses that will do limited runs of PC boards, as well as board houses for prototypes. 73

## New Digital Frequency Lock AVCOM's PSA-65C Portable Spectrum Analyzer

- \*Battery or Line Operated
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- \*Digital Display of Center Frequency, Start/Stop Frequency of Sweep and Span
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AVCOM's newest Portable Microwave Spectrum Analyzer, model PSA-65C, has an expanded frequency range from less than 1 MHz to 1250 MHz, for the amazing price of \$2930.

AVCOM's new PSA-65C is a low cost general purpose spectrum analyzer that's loaded with standard features including FM audio demodulator, AM detector and digital frequency lock. The PSA-65C covers frequencies thru 1250 MHz in one sweep with a sensitivity greater than -95 dBm at narrow spans. The PSA-65C is ideally suited for 2-way radio,

**SWEEP RATE** controls the speed of the sweep across the CRT.

Scale selects an amplitude sensitivity of either 10 dB/DIV or 2 dB/DIV.

**TUNING** adjusts the center frequency of the analyzer so that signals of interest appear on the center of the display and their frequency is read out on the LCD.

**Backlit LCD** that shows CENTER FREQUENCY of the PSA-65C in tenths of a MHz, span in MHz Div, and START/STOP frequency of SWEEP.

**Digital Frequency Lock (DFL)** on/off control.

**REFERENCE LEVEL** adjusts input attenuator and IF gain so that top graticule corresponds to indicated signal level. Calibrations in dBm and dBmV are provided.

**ZERO SPAN** instantly places analyzer in zero span mode and activates audio demodulator for convenient monitoring.

**SPAN** controls the width of the spectrum being displayed and automatically selects optimum resolution filter.

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**RF INPUT** accepts signals to be observed from less than 1 MHz to greater than 1250 MHz.

**FINE TUNE** allows fine changes in center frequency. Greater adjustment range on left knob settings, finer adjustment on right knob settings.

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# THE DIGITAL PORT

Jack Heller KB7NO  
P.O. Box 1792  
Carson City NV 89702-1792  
[jheller@sierra.net]

There are some new items of interest to those who read this column. Recently, there was a bit of mail concerning the need for more on RTTY. I won't lay claim to having covered all the software and hardware combinations, but there is something very unique that isn't by any stretch of the imagination pure RTTY.

In fact, at least one opinion says it may be the replacement. The new mode is PSK31. I have observed hams who have been developing it for quite some time, and I admit I didn't fully understand or appreciate just what they were up to.

## You may have most of the stuff already

The reports sound very compelling. The hardware needed is already in many ham shacks: a computer with a 16-bit sound card and an HF radio that is stable. It is necessary to build cables from the sound card to the radio. Those of you who have worked with the ChromaPIX SSTV program are already there.

The other essential to get up and running contains that "F" word popular among hams (the one you can say on the air): free! Yes, the software is free for the download from [http://aintel.bichu.es/psk31.html].

The truth is, I have downloaded the Windows version of the software, but haven't got into the test mode as yet. I think that if RTTY excites you, you will want to get to this without delay. The zipped program is small enough to put on a floppy at around a megabyte. You will find extensive, well written help files. I printed a little over forty pages of them and it looks like an easy mode to get up and running according to all I read about it. I will have it going in

the next few weeks and let you know what I see.

The advantages of the mode sound almost too good to be true. First and most significant is the width of the signal. When you have everything calibrated properly, it is about 31 Hz wide — fabulous! They say it is so narrow, you will easily tune past a signal, weak or otherwise, if you move too quickly. That reminds me: On the Web site, you will find a demo of the sound you are looking for. It is described as a warble, but I felt it was closer to a pure tone with a slight waver. I think that is due to the narrow bandwidth.

## New DSP program for your sound card

I have made frequent mention of the excellent SSTV program ChromaPIX, and I hear excellent reports from users. The program, as many of you are aware, is a Windows-based one that utilizes the sound card — thus eliminating the need for additional hardware to send and receive images over the air with DSP filtering.

Recently, Jim N7CXI announced his latest Windows-sound card offering. If you go to the ChromaPIX Web page, you will find, in addition to the SSTV programs, a rundown on ChromaSound. You may download this program (a little over 3 megabytes), execute it, direct the sound from the output of your rig to the sound card on your computer, and start enjoying the marvels of DSP filtering via the output of your sound card.

It is a beta program, looks well finished, and is the product of a lot of work — I think you will enjoy it. It is already configured for regular sideband audio with selectable options for you to point-and-click for

individual situations. The screen display includes a spectrum analyzer so you can "see what you are hearing." I like that concept. I find that my listening abilities do not always translate directly to the proper knobs to turn on the audio filter.

Once again I must beg inability to give a complete evaluation, as I have not put the program to the real test. So many toys, so little time.

If it weren't for you observant readers, I would get away with almost anything. Perhaps it pays to get off track once in a while; at least several pieces of E-mail have served to awaken my senses.

A welcome wakeup call came via E-mail from Jason KC8ERI, who commented on a statement I recently made about the Internet spiriting away the potential hams among our younger set. I was pleased to make the acquaintance of what I will term a well balanced 16-year-old mentality.

Jason has been using both ham radio and the Internet to further his education in this high tech world. He didn't simply get a ham license and make the rounds of the FM repeaters. Jason got into packet radio and notes the comparison of speed between packet and the Internet. He offers the opinion that sometime in the future he intends to find a way to not only improve on speed but to add graphic content to packet communication. In other words, he is going to make a contribution to ham radio.

This is the kind of people we must attract to our ranks. I got the impression that he is active in a local club and that the club members have found ways to stimulate his interest. This is one gung-ho young man who will succeed at whatever he desires. I am sure.

## Defining "digital"

I received an interesting piece of E-mail from Klaus DL4KCK concerning some of the subjects of this column. He makes a valid comment that one of the modes discussed here is not really digital. He refers to SSTV, and says

we may stretch the definition for certain program-hardware combinations such as those using the sound card in the computer.

There is certainly no intention of pulling the wool over anyone's eyes to make them think that all modes discussed are pure "anything." They are simply exciting ham radio modes, and I like to see more hams having fun. If I err on the side of bringing useful information to my readers, so be it. My skin is thick enough to take the flack. No offense intended. Klaus is a well grounded ham, with experience in the field as well as writing abilities. He lists himself as "2nd editor TV-AMATEUR." And there is no argument from this end.

## Missing info

Another piece of E-mail from Thad KF2PL awakened me to the fact there was a piece of info missing in the URL chart. Believe it or not, Thad was reading an article from the July '97 issue in which I commented about the XPWare program for the PK-232MBX. He wanted to know where to find it.

It can be exasperating using a search engine to find something you know is out there. I find listings disappearing that were easily located a year ago. So that fine piece of shareware is listed in the chart starting this month. You will find the program available with a substantial trial period upon download.

## MFJ software?

Another reader, J.P. KA3BWP, sent a request to locate some software that made me aware of a void in our aftermarket software for TNCs. Correct me if I'm wrong, but I could find only one listing for a program for the MFJ 1278 multimode. Perhaps it is difficult to write for.

I found an old listing from several years back that was, at that time, in the Hamnet library on CompuServe. It no longer existed, and a search on the Internet for that software file proved fruitless. Another search

found a UK Web site for Venus Software at [http://www.venus.wv.demon.co.uk/vencatam.htm]. There is a program called Skyriders available there. That was all I found, and passed the address on to J.P. If someone knows of other software out there, please let me know.

## Antenna update

The mobile antenna article has continued to provoke comments. It has been a great experiment, at this end at least. I have learned a lot. It is successful to a point. For a time, I thought I had a piece of magic growing on the side of the vehicle because it would load on 40, 20, and 15 with no change at the antenna.

It wasn't magic. There is an explanation. The antenna itself resonates on 20 meters and that is it. However, with the 20+ feet of coax connected to it, the antenna appears to resonate, at the transmitter end of the coax on the other two bands. I will, at some point in my life, determine if I can, by varying this length, accomplish a better match and/or cause a match on some other band.

Another revealing part of this project was the use of the LDG Electronics (see chart) antenna tuner. I mentioned previously that I would get one of these kits to see if I could minimize the time of loading the antenna while the vehicle is in motion and keep the eyes where they belong (on the road). The LDG tuner is a marvel. It contains a processor with a sophisticated program that can determine the proper inductance and capacitance combination in just a few seconds when given a load that looks anything like an antenna.

The processor selects among 17 relays, energizes the ones that appear correct, resamples the SWR, tweaks as necessary, and displays via lighted LEDs where the match stands at any given moment. It also allows for manual changes if you wish to reduce the SWR to get closer than the "less than 2:1" the processor accepts. The fun part is

listening to the relays quickly rattling away while this selection and sampling process takes place. When the relays shut up, which takes a very short time, the match is made.

## Off track

The learning process takes a familiar turn as I receive comments from you folks. I did receive one negative comment; that is understandable because the antenna project seems a little far-fetched for a column that should be focused on digital communication — even if the goal is mobile/portable digital modes.

However, there was a very educational E-mail from Max KO4TV, who gave me a lot of insight into mobile antenna engineering. That was a part of his livelihood through his working years.

Max explained first that the base-loaded antenna I had devised was highly inefficient when compared with a center-loaded one. He also chastised me a bit for not speaking highly of the "screwdriver" continuous tuning mobile antenna, as he has had a lot of good luck with such apparatuses. I will not argue with either point.

The reason for the base-load configuration was cost. The other methods mentioned appeared to be impractical at the outset. Max tells me that he has been more inventive than I and has managed to home-brew screwdriver antennas on a very low-buck budget. I am going to have to spend a little time and get the details from him. That would be a worthwhile project.

I took a look, just for curiosity, on the Internet with a search for "screwdriver antenna," and found a Web site where plans could be

ordered for a few dollars from someone else who had apparently done the experimenting.

What does it all mean? We are never done experimenting in ham radio. Just look at this month's column. We have touched on a new version of RTTY (PSK31 — I hope that reference to RTTY doesn't offend), a sound card DSP filter, some antenna ideas that were news at least to me, plus glimpses at innovative hams and their creations.

There is so much to this hobby that is up-to-the-minute and cutting-edge that I wonder what holds people back from wanting to try it all.

If you have questions or comments about this column, E-mail me at [jheller@sierra.net] and/or CompuServe [72130,1352]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO. 73

## Current Web Addresses

Source for:	Web address (URL)
HF serial modem plans + software	http://www.accessone.com/~tmayhan/index.htm
PCFlexnet communications free programs	http://d10td.afthd.th-darmstadt.de/~flexnet/index.html
Tom Sailer's info on PCFlexnet	http://www.ife.ee.ethz.ch/~sailer/pcf/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom — German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
Winpack shareware for Windows	http://www.duckles.demon.co.uk/ham/wp.htm
New Mode — Free DL	http://aintel.bi.ehu.es/psk31.html
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software/baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
Tucson Amateur Packet Radio — where packet started — new modes on the way	http://www.tapr.org
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & W95SSTV	http://www.siliconpixels.com/
Timewave DSP & former AEA prod	http://www.timewave.com
International Visual Communication Association — a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
XPWare — TNC software with sample DL	http://www.goodnet.com/~gjohnson/
Small computer boards, various kits	http://www.ldgelectronics.com

**Table 1.** Current Web addresses. If you encounter a problem with a European address, the network is often at fault. Try again later.

# CALENDAR

Listings are free of charge as space permits. Please send us your Calendar item two months in advance of the issue you want it to appear in. For example, if you want it to appear in the October issue, we should receive it by July 31. Provide a clear, concise summary of the essential details about your Calendar event.

## JUNE 13

**BETHPAGE, NY** The Long Island Mobile ARC, of Levittown NY, will sponsor the Long Island Hamfair, Sun., June 13th, 8:30 a.m.-2 p.m. at Briarcliffe College, 1055 Stewart Ave., in Bethpage. General admission \$6, children and sweethearts free. Free parking for buyers. Vendors: All spaces \$15 each, each space admits one person. Parking in assigned spaces. This event will feature amateur radio equipment, computers, CB equipment, TV, and a VHF tune-up clinic where you can get your rig checked. Ham equipment dealers and ARRL info will also be available. Talk-in on W2VL 146.85 rptr. (136.5 PL). For more info call the LIMARC 24-hour infoline, (516) 520-9311. E-mail [hamfest@limarc.org]. Richie Selzer N2WJL is the Hamfest Chairman. See the Web site at [http://www.limarc.org].

**INDEPENDENCE, KY** The Northern Kentucky ARC will hold their "Ham-O-Rama '99" on Sun., June 13th at the Summit View Middle School in Independence KY. From I-75 go east on I-275 to Exit 80 (Covington/Independence-KY 17). South on KY 17 (towards Independence) 5-1/4 miles. For more info or reservations, contact N8JMV c/o NKARC, P.O. Box 1062, Covington KY 41012; or call (513) 797-7252 in the evening. Indoor exhibit area for major vendors. Extensive outside flea market with setup at 6 a.m. General admission begins at 8 a.m. Admission \$4 in advance, \$5 at the gate. Children under 14 admitted free. Flea market spaces \$2 each (tables not furnished). Indoor vendor space \$15 per table provided. Talk-in on 147.255(+) and 147.375(+) rptrs.

**KNOXVILLE, TN** The Radio Amateur Club of Knoxville is

sponsoring the 33rd annual "Knoxville Hamfest and Electronics Flea Market" on June 13th at the National Guard Armory, 3330 Sutherland Ave., in Knoxville. Open to the public 9 a.m.-4 p.m. Admission \$5. 8-ft. tables will be supplied for \$15 each. AC power also available. Free dealer passes will be provided for all designated workers. Free beverages available for all inside dealers. Access for dealers and other indoor participants starts Sat., June 12th, 12 noon-8 p.m. ET. Access also available on the day of the hamfest, starting at 6 a.m. ET. Free parking and handicap access. Free outdoor tailgate space with each paid admission. VE exams begin at 2 p.m., registration must be completed before 1:30 p.m. Test fee is \$6.45, payable to WCARS/VEC, exact cash or check, please. There will be a clinic showing how to use new technology ham radio equipment. A free product literature and product promotional items area will also be featured. Forums are being planned to discuss ham radio in the next century, public service activities, computer architecture, new FCC regulations, DX, etc. Exhibits will feature new technology equipment, satellite communications and emergency communication equipment. Talk-in on W4BBB 147.30(+), 224.50(-), 444.575(+). For general info and reservations, contact David Bower K4PZT, P.O. Box 50514, Knoxville TN 37950-0514. Tel. (423) 974-5064 (w) or (423) 670-1503 (h). E-mail [rack@kornet.org]. For updated info check the Web page at [http://www.kornet.org/rack].

**SUFFIELD, OH** The 32nd Annual Hamfest and Family Picnic will be sponsored 8 a.m.-4 p.m. by the Goodyear ARC at the Goodyear Wingfoot Lake Park, located near Suffield OH, 10 miles east of

Akron. Enter from Rte. 43, one mile south of Rte. 224. Admission \$4 in advance or \$5 at the door. One ticket admits ham, spouse and children. Flea market spaces \$10 each or \$8 in advance. Vendors (pavilion) \$8 in advance or \$10 the day of the hamfest. Make checks payable to the Goodyear ARC and mail with an SASE to David R. White, 719 Notre Dame, Cuyahoga Falls OH 44221. VE exams available. For more info call Dave White at (330) 928-7625 or E-mail [rjtaylor@akron.infi.net]. Talk-in on 146.985 or 146.520. Park rules: no pets, no firearms, no pornographic materials.

**WHEATON, IL** The Six Meter Club of Chicago, Inc., will hold its 42nd Annual ARRL-sponsored Hamfest at the DuPage County Fairgrounds, 2015 Manchester Road [north of Roosevelt Road (Route. 38), east of County Farm Road], in Wheaton. Free parking. No extra charge for space in the outdoor flea market. Tickets are \$5 in advance, for attendees over age 12, \$6 at the gate. Advance tickets are available from Joseph Gutwein WA9RIJ, 7109 Blackburn Ave., Downers Grove IL 60516, or from any club member. Commercial tables, 8-ft. w/110V \$15 each. Indoor flea market tables, 8-ft., no electric, \$12 each. Overnight RV parking, includes electrical hookup, \$10 each. Send an SASE with check or m.o. payable to Six Meter Club of Chicago, and mail to 7109 Blackburn Ave., Downers Grove IL 60516, no later than May 30th. For information call the 24-hour InfoLine, (708) 442-4961. Buildings are open to the public at 8 a.m. VE exams 9 a.m.-11 a.m., call the InfoLine to pre-register for testing. Handicapped parking at the east gate. General parking at the west gate. Sellers, use east gate. Absolutely no alcoholic beverages permitted. All sellers responsible for cleanup of their spaces.

## JUNE 18, 19, 20

**RED DEER, ALBERTA, CANADA** The Central Alberta Radio League (C.A.R.L.) will host its 29th Annual Picnic and Hamfest at the Burbank Campsite located approximately 8 km NE of Red Deer. Talk-in on 147.150 (+600) or 146.520 simplex. For info contact

Bob VE6BLD, 5540 54th Ave., Lacombe, Alberta, Canada T4L 1L6. Tel. (403) 782-3438 evenings. E-mail [kingel@telusplanet.net] or [ve6bld@rac.ca]. Or E-mail C.A.R.L. at [carl@qsl.net]. Visit the home page at [http://qsl.net/carl/]. Bill VE6WMG, at (403) 749-2063, is also available to relay more info about this event.

## JUNE 19

**DUNELLEN, NJ** The Raritan Valley Radio Club, Inc., will present a hamfest on June 19th, 7 a.m.-2 p.m., at Columbia Park in Dunellen, near the intersections of Route 529 and 28. Sellers can set up at 6 a.m. Admission \$5. Spaces \$5 each. Official DXCC and WAS verification. Talk-in on 146.025/1.625 and 146.520 simplex. Contact Bob Pearson WB2CVL, (732) 846-2056; or Fred Werner KB2HZO, (732) 968-7789 before 8 p.m.

**MARMORA, ONTARIO, CANADA** The 1999 Eastern Ontario Hamfest and Computer Flea Market will be held Sat., June 19th, 9 a.m.-2 p.m. at the Marmora Area Curling Club, Crawford Drive, Marmora. Marmora is located about 40 miles east of Peterborough on Highway 7 (the Trans Canada Highway) and about 30 miles north of Belleville, Ontario, on Hasting County Road 14 (formerly Highway 14). Talk-in will be on 146.520 MHz. Contact Paul VE3UUM at (613) 472-3449; Pete VA3PGB at (613) 473-1171; or E-mail [rhobson@bvl.igs.net]. See the Web page at [www.redden.on.ca/~tcarc/tricnty.htm].

**MIDLAND, MI** The 23rd Annual Hamfest, sponsored by the Midland ARC, will be held at the Gerstacker Fair Center at the Midland County Fairgrounds in Midland. The show features amateur electronics and equipment, both new and used, VE exams, and door prizes. Doors open to the public 8 a.m.-1 p.m. Setup is at 6:30 a.m. Admission is \$4, advance reserved tables \$6 each plus admission; walk-in tables, if available, \$10 plus admission. Trunk sales \$5 per spot plus admission. Talk-in repeater W8KEA, 147.00(+). For more information, write with an SASE to M.A.R.C. Hamfest, P.O. Box 1049, Midland MI 48641-1049. Or call Del Lafavor at (517) 636-5097



(w), (517) 689-3477 (h); or E-mail [lafevorde@aol.com].

## JUNE 20

**CAMBRIDGE, MA** The MIT Electronics Research Society, the MIT Radio Society, and the Harvard Wireless Club will hold a tailgate electronics, computer, and amateur radio flea market 9 a.m.–2 p.m. at Albany and Main Sts. in Cambridge. Admission \$4. Free off-street parking. Fully handicapped accessible. Sellers \$10 per space at the gate, \$9 in advance, includes 1 admission. Setup at 7 a.m. Covered tailgate area available for all sellers. For space reservations or further info call (617) 253-3776. Mail advance reservations before June 5th to *W1GSL, P.O. Box 397082 MIT BR, Cambridge MA 02139-7082*. Talk-in on 146.52 and 449.725/444.725 PL 2A W1XM rpt.

**MONROE, MI** The Monroe County Radio Communications Assn. will hold its annual "Monroe Hamfest" 7:30 a.m.–1 p.m. at the Monroe County Fairgrounds, 2 miles west of Monroe on M-50. Setup starts at 6 a.m. Indoor tables \$15 for first 8-ft. table and 1 ticket; \$10 for each additional table. Trunk sales \$6 per 8-ft. space. Overnight camping \$15. Free parking. Talk-in on 146.72. Admission \$6 in advance (includes two stubs for the drawing), \$6 at the door, with one stub. Contact *Fred VanDaele K4EBI, 4 Carl Drive, Monroe MI 48162*. Tel. (734) 242-9487 after 5 p.m.

## JULY 4

**BRESSLER, PA** The W3UU 27th Annual Fire Cracker Harrisburg RAC Hamfest and Computer Show will be held Sun., July 4th, at Emerick Cibort Park in Bressler (near Steelton/Harrisburg PA). Setup at 6 a.m. General admission at 8 a.m. No food or beverage sales permitted by vendors or tailgaters. All vendors must have a PA Sales Tax Permit and must collect the sales tax. Donation \$5. XYL, YL and kids free. Persons entering the park before 8 a.m. will be charged a minimum of (1) tailgating space or minimum of (1) table! Tailgating \$5 per space. Make your table reservations early. Tables under roof with electricity \$15 each for the first three tables; additional tables \$12

each if paid before June 15th. After June 15th all tables are \$18 each. Talk-in on 146.16/76 MHz and 146.52 MHz simplex. For hamfest info call (717) 939-4825. For table reservations, contact *Richard Bordner W3NJB, 2501 South 2nd St., Steelton PA 17113*. E-mail [n3njb@aol.com]. Send an SASE for a map, lodging, and restaurant info. VE exams at the Friendship Fire Hall at 9 a.m. Follow the hamfest signs, on Hwy. 441, to the square. At the square take the "y" to the left onto Main St., as if going to the hamfest. Go 0.7 mile to the Friendship Fire Hall on the right at the corner of Main and Center. Just walk in. Space is limited. Items required: your original FCC license (if licensed) and a copy of the license; any original CSCEs and a copy; two (2) forms of ID (at least one photo ID) showing your full name and address; and a check or money order in the amount of \$6.45 made out to ARRL/VEC.

## JULY 10

**PETOSKEY, MI** The Straits Area ARC's 23rd Annual Swap & Shop will be held Sat., July 10th, at Emmet Co. Fairgrounds in Petoskey on U.S. 31, 2 blocks west of 131, 8 a.m.–1 p.m. Talk-in on 146.68(-). Admittance \$3 at the door. Tables \$5, splits OK. VE exams at the American Red Cross Bldg. at 1 p.m. For testing info., contact *Tom W8IZS, (616) 539-8459; or Dirk KG8JK (616) 348-5043, [kg8jk@qsl.net]*. For testing info, contact *Floyd KG8CS, (616) 526-5503*.

## JULY 11

**PITTSBURGH, PA** The North Hills ARC will hold its 14th annual Hamfest July 11th, 8 a.m.–3 p.m. at the Northland Public Library, 300 Cumberland Rd., approximately 10 miles north of Pittsburgh on Route 19 North. From Pittsburgh take Exit 18 on Rte. 279 to McKnight Rd., north to left on Cumberland Rd. From I-79 Exit 22 take Rte. 910 east to Rte. 19, south to Cumberland Rd. From PA Turnpike Exit 3 take Rte. 19 south through Wexford on Rte. 19, turn left onto Cumberland Rd. at the Sunoco. Talk-in and check-ins will be on 149.09 W2EXW, the North Hills ARC rpt. Free admission. Free parking. One free automobile-sized space per tailgater; each

additional space \$5. The hamfest is handicapped/wheelchair accessible. Contact *Rey Whanger W3BIS, 120 Cove Run Road, Cheswick PA USA*. Tel. (412) 829-9383. E-mail [w3bis@freewweb], or check the Web site at [http://nharc.pgh.pa.us].

**VALLEY FORGE, PA** The Mid-Atlantic ARC will host a Hamfest at Kimberton Fire Company Fair Grounds, Rte. 113, south of the intersection with Rte. 23, on July 11th, starting at 7 a.m. Indoor-outdoor space available. Indoor tables with electr. 1–4 \$10 each; 5 or more \$8 each, not including admission. Tailgating \$5, no reserved tailgate space. Admission \$5. Talk-in on 146.835(-) and 443.80(+) CTCSS 131.8. Computer and electronic hobbyists are welcome. Contact *MARC, P.O. Box 352, Villanova PA 19085*; or call *Bill Owen W3KRB at (610) 325-3995*. E-mail [wb3joe@marc-radio.org]. The Web site is at [http://www.marc-radio.org/hamfest.html].

## JULY 18

**CAMBRIDGE, MA** A tailgate Electronics, Computer, and Amateur Radio Flea Market will be held Sun., July 18th, 9 a.m.–2 p.m. at Albany and Main Sts. in Cambridge. Admission \$4. Free off-street parking. Fully handicapped accessible. Sellers \$10 per space at the gate, \$9 in advance—includes 1 admission. Setup is at 7 a.m. For space reservations or further info call (617) 253-3776. Mail advance reservations before July 5th to *W1GSL, P.O. Box 397082 MIT BR., Cambridge MA 02139-7082*. This event will be held rain or shine. Covered tailgate area available for all sellers. Talk-in on 146.52 and 449.725/444.725 PL 2A, W1XM rpt. Sponsored by the MIT Radio Society and the Harvard Wireless Club.

**SUGAR GROVE, IL** The Fox River Radio League will hold their Annual Hamfest at Waubensee Community College, Rte. 47 at Harter Rd., Sugar Grove IL (5 miles NW of Aurora). Doors open Sun. at 8 a.m. with setup Sat. at 7 p.m., and Sun., 6 a.m.–8 a.m. VE exams at 10 a.m. Bring original license, copy of license, and photo ID. Talk-in on 147.210(+) PL

103.5/107.2. Contact *James Von Olnhausen N9UZZ, c/o FRRL, P.O. Box 673, Batavia IL 60510*. Tel. (630) 879-3042; or E-mail to [n9uzz@amsat.org]. The Web site is at [http://www.frll.org/hamfest.html]. The Fox River Radio League is celebrating 75 continuous years as an amateur radio club. There will be special anniversary promotions at the hamfest.

**VAN WERT, OH** The Van Wert, Ohio, ARC's 12th Annual Van Wert Hamfest will be held at Van Wert County Fairgrounds, US Rte. 127 South, 8 a.m.–3 p.m. Radios, computers, software, electronic parts, new and used. Indoor tables and outdoor trunk sales. Free parking. Overnight \$10. Tickets \$5. Talk-in on 146.85(-). For table reservations, send an SASE with your name and address to *Van Wert ARC, P.O. Box 602, Van Wert OH 45891-0602*; Tel. (419) 238-1877; or E-mail *Bob WD8LPY at [barnesr@bright.net]*; Web site is [http://www.bright.net/barnesr/w8fy.html]. 8-ft. tables \$10 each (includes one free ticket). Trunk sales: 12-ft. x 1-ft. area, \$5 plus ticket. VE exams: Must pre-register by July 11th. Contact *Bob High KA8IAF, 12838 Tomlinson Rd., Rockford OH 45882*. Tel. (419) 795-5763.

## SPECIAL EVENTS, ETC.

### WORKED ALL PARISHES

**BATON ROUGE, LA** The Baton Rouge ARC continues to offer the Worked All Parishes award for hams who can show confirmation of contacts with all 64 Louisiana parishes on or after September 1, 1996. For further information, send SASE to *L. Wayne Gordon K5EOA, Baton Rouge Amateur Radio Club, PO Box 4004, Baton Rouge LA 70821*.

## JUNE 12

**RONDOUT, IL** The Lake County IL RACES will operate W9R, 1400Z–2300Z June 12th, commemorating the 75th anniversary of the Great Rondout Train Robbery. Operation will be on 146.490 simplex; 7.283, 14.283 and 28.383 phone; 7.037, 14.037 and 28.037 CW. A commemorative certificate suitable for framing is available from *Lake County RACES, 1303 N. Mil-*



## DEAR READERS,

I need your help! I really appreciate your sending in your feedback cards. Now, I'd like to know something about your hamshack habits.

Return this survey and take part in 73's random drawing of all the survey responses received by **July 31, 1999**.

The winner will receive \$100 cash and a Life Subscription to 73 (okay, so you're already a "lifer" — give your "prize" to your grandchild).

I'm also giving away 50 surprises to the first 50 people who respond. We'll announce the big winner's name in our September '99 issue. So, please answer the questions and return them to me at:

Wayne Green W2NSD/1  
73 Amateur Radio Today  
70 Hancock Road  
Peterborough NH 03458

FAX to (603) 924-8613  
E-mail: design73@aol.com

Thanks,

*Wayne*

Your name & call

Street

City/State/ZIP

Tel.

- 1.) How did you get this copy of 73?  
☐ subscription ☐ dealer ☐ borrow  
☐ other
- 2.) How many other people read this copy?  
☐ none ☐ one ☐ two ☐ three or more
- 3.) What other ham magazines do you subscribe to?  
☐ QST ☐ CQ ☐ CQ/VHF ☐ Worldradio  
☐ other
- 4.) What is your license class?  
☐ Novice ☐ Tech ☐ Tech Plus  
☐ General ☐ Advanced ☐ Extra
- 5.) How old are you?  
☐ under 20 ☐ 21-30 ☐ 31-40 ☐ 41-50  
☐ 51-60 ☐ 61-70 ☐ exalted
- 6.) What are your favorite hamming activities/modes (check all that apply)?  
☐ CW ☐ SSB ☐ QRP ☐ RTTY  
☐ SSTV ☐ FSTV ☐ RDFing ☐ packet  
☐ microwaves ☐ moonbounce ☐ hamsats  
☐ repeaters ☐ contesting ☐ club activities  
☐ DXing ☐ certificate hunting ☐ kit building  
☐ tube equipment ☐ original design & construction  
☐ mods ☐ other
- 7.) Do you use a computer in conjunction with hamming?  
☐ yes ☐ no (if no, go to question 10)
- 8.) If so, do you use it for:  
☐ operating ☐ getting info ☐ chat and BBS  
☐ other
- 9.) If so, is it a:  
☐ PC ☐ Mac ☐ desktop ☐ laptop
- 10.) Approximately how much did you spend on ham gear in 1997?  
☐ nothing ☐ \$1-100 ☐ \$101-500  
☐ \$501-1000 ☐ \$1001-2000 ☐ \$2001+
- 11.) Approximately how much did you spend on ham gear in 1998?  
☐ nothing ☐ \$1-100 ☐ \$101-500  
☐ \$501-1000 ☐ \$1001-2000 ☐ \$2000+
- 12.) Approximately how much have you spent in the first six months of 1999?  
☐ nothing ☐ \$1-100 ☐ \$101-500  
☐ \$501-1000 ☐ \$1001-2000 ☐ \$2000+

- 13.) Approximately how much will you spend in the second six months of 1999?  
☐ nothing ☐ \$1-100 ☐ \$101-500  
☐ \$501-1000 ☐ \$1001-2000 ☐ \$2000+

- 14.) Approximately how much will you spend on ham gear in 2000?  
☐ nothing ☐ \$1-100 ☐ \$101-500  
☐ \$501-1000 ☐ \$1001-2000 ☐ \$2000+

- 15.) I would like to see more ads in 73 on the following:  
☐ xcvs ☐ antennas ☐ towers ☐ rotors  
☐ HTs ☐ power supplies/amps ☐ mobile ops  
☐ antenna tuners ☐ keyers/keys ☐ mics  
☐ meters/test equip. ☐ scopes ☐ discrete parts  
☐ lightning/surge protectors ☐ ham software  
☐ computer hardware ☐ surplus equip. ☐ kits  
☐ code courses ☐ wire/cable ☐ repeater ops  
☐ books ☐ ham magazines ☐ batteries  
☐ computer magazines ☐ QRP ☐ ATV/SSTV  
☐ tubes/tube equip. ☐ filters ☐ local dealer  
☐ products and specials ☐ station accessories  
☐ RTTY ☐ packet ☐ other

- 16.) Refer to our ad index on page 49. Please name your Top Ten advertisers NOT LISTED THERE that you would like to see in 73:

1. \_\_\_\_\_ 6. \_\_\_\_\_
2. \_\_\_\_\_ 7. \_\_\_\_\_
3. \_\_\_\_\_ 8. \_\_\_\_\_
4. \_\_\_\_\_ 9. \_\_\_\_\_
5. \_\_\_\_\_ 10. \_\_\_\_\_

- 17.) I might buy something from these 3 companies if I saw more ads from them or knew more about their products:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

- 18.) The thing I like least about 73 is: ☐ (Write clearly)

- 19.) The thing I like most about 73 is:

wauke Ave., Libertyville IL 60048.  
Check the Web site at [www.races.org] for last minute updates.

### JUNE 12, 13

#### PORTUGAL DAY DX CONTEST

The Rede dos Emissores Portugueses will sponsor the Portugal Day DX Contest on phone (SSB) only, on 10 15, 20, 40 and 80 meters, using the recommended IARU band plan for Region 1. For more information, contact REP—Rede dos Emissores Portugueses, Award/Contest Manager, P.O. Box 2483, 1112 Lisboa Codex, Portugal.

### JUNE 15-30

**GREENVILLE, TX** The Sabine Valley ARA will operate W5A from June 15th–June 30th, during Field Day. QSL to SVARA, P.O. Box 8122, Greenville TX 75401.

### JUNE 19, 20

**CHACO CANYON, NM** Special Event Station N5C will operate Sat. and Sun. 1600 UTC–2400 UTC from Chaco Culture National Historical Park NM (grid square DM66ba) in CW, SSB, AMTOR and FM, on 2–40 meters QRO and QRP, in the Novice/Tech/General portions of the bands. Chaco

Canyon is one of the oldest and most mysterious sites in the southwestern USA. Several ancient astronomers had recorded their observations for all to see over 1,000 years ago on the walls in Chaco. QSL and SASE with a #10 envelope to N5C, Jay Miller WA5WHN, P.O. Box 6552, Albuquerque NM 87197-6552, USA. E-mail [wa5whn@hotmail.com] for more info about this Special Event Station; or view the following URL: [http://www.swcp.com/~n5zgt/]. Click on the N5C icon.

### JULY 18

**STRATFORD, NY** The Fulton

County Dr. Mahlon Loomis Committee will operate W2ZZJ on July 18th to commemorate the 173rd anniversary of the birth of Dr. Loomis, the American radio pioneer, who was born at Oppenheim NY on July 21st, 1826. Operation will be from 1300–2000 UTC on the General class phone portion of 75, 40, and 20 meters, and on the Novice 10 meter phone band. Also on area 2-meter FM repeaters. For a parchment certificate and extensive literature, send QSL, contact number, and a #10 SASE (55 cents) to George P. Sadlon W2ZZJ, 5738 St. Hwy. 29A, Stratford NY 13470 USA. **73**

## NEVER SAY DIE

continued from page 4

benefits and excitement they provide.

This is pretty much the way the Sudbury Valley School in Framingham (MA) operates, and their graduates are outstanding. Did you bother to read the \$9 book about the school I reviewed in an earlier editorial, which is also reviewed in my *Guide to Wisdom*? I was afraid not. I can lead you to the Fountain of Youth, but I just can't get you to drink. Not even a sip.

There's a lot more to my school proposals, but I've written about them before. The potential is there for us to reinvent our public schools and make them the very best in the world.

### Unions

It's been quite some time since I made a serious effort to anger union members. My apologies.

Thomas Sowell got me going with this: "The biggest single obstacle to the improvement of American education is the National Education Association, by far the country's biggest union."

Unions served an important purpose when they were started, giving workers some bargaining power with employers. Unfortunately, power corrupted the unions, just as it had employers. I won't go into a twelve volume history of union corruption. But I have seen it first hand in my own work when I was working for GE, for WPIX in New York as a cameraman, and with the first printer I used for 73. Both the stage hands' and the printers' unions were so closed that only the sons of union members could join, thus keeping wages artificially high.

Unions have had a powerful role in forcing manufacturers to move blue-collar work out of the country. And they are the major power behind the escalation of the minimum wage (thanks, Ted Kennedy!) — which keeps kids from getting low-wage entry jobs into the workforce.

The NEA keeps endlessly repeating that the only problem with the American public school system is the lack of money. It would be difficult for the NEA to tell a bigger lie. There are endless studies which show that more money has virtually no effect on the quality of American education. We're already spending twice as much as other countries whose students outscore ours on international tests.

Unfortunately, the NEA's lobbying (\$) in both state and national elections has the Clinton Administration and Democrats solidly backing the throwing of still more money into the school system. The cost per pupil has been zooming upward as fast as the kids' test scores have been plummeting.

The failure of our school system isn't due to lousy parents, TV, or "society," it's due to the NEA, the bribed Democrats, and the failure of the Republicans to touch the subject with a ten-foot pole. Phooey on both your houses. At a time like this I sure wish Perot hadn't made such an awful mess of his Reform Party.

### Colleges

India has a college system that's helping to fill the engineering vacuum created by our rapidly declining American colleges. Maybe you've read about the Indian Institute of Technology. If so, you know that over 30% of their graduating classes head immediately for the US, with most moving to Silicon Valley.

Our public schools are the major problem, with their not teaching the math and science fundamentals that engineers and technicians need. But our colleges are pathetically out of touch with the current world, held there by the power of their entrenched faculties, who have been fighting to prevent change. I've had first-hand knowledge of that.

Please read *The Fall of the Ivory Tower* by Hillsdale College president Roche. It's a scary exposé of our universi-

ties today. Yes, I've reviewed it in my editorials and it's in my wisdom guide.

### Die De Die

The ham industry manufacturers (and dealers) are hurting. Badly. Unfortunately, as happened 35 years ago, some, perhaps many, are going to go out of business. No, it doesn't have to happen — if they keep in step with the times and don't try to do business today the way they did it in the past.

The world of amateur radio in 1999 is different, even from the way it was in 1997, just a couple years ago. Different? You bet. Maybe you haven't paid attention to what's been happening with the new licenses and how they've dropped dramatically in the last couple of years. I've been chronicling this in my editorials, but I suspect that few manufacturers have been bothering to read 'em.

The worst newcomer drop has been in the General-and-up classes, the people who are the best candidates for buying HF equipment, towers, rotators, and beams. As of last November, 94.5% of all new licensees were Techs! Worse, the number of these new Tech licensees is down 47% in the last two years. Plot this on some graph paper (or on your computer) and you'll see that if this continues as it has for the last two years, we'll have zero new licenses being applied for within two years.

So where can the industry turn for the changes needed to turn this catastrophe around? Well, our *only* national organization is the League, and it seems to be managed by a bunch of old men with no vision of the present, much less the future. These are the fuddy-duddies you can't keep yourself from re-electing as directors.

If I were a manufacturer today I'd make damned sure that I had some products of interest to Techs, since they are the newcomers to the hobby — and the biggest part of the market is the newcomers

who are buying their first stations and antennas. Since the number of Techs upgrading to HF tickets has dropped off almost 50% in the last couple of years, and is projected to reach zero by 2006, the HF market is not going to do much unless we see some major rule changes. Major.

With the Techs rightfully assessing the League as their enemy, advertising in *QST* is mainly going to reach the old-timers, most of whom already have all the equipment they're going to need until we see some new technologies developing that aren't even on the radar screen so far.

Techs are not into contests, so they're not reading *CQ* either.

Gee, I wonder what magazine they're reading?

The ham manufacturers could get the League directors to start thinking if they wanted. If a few started moving their ads from *QST*, the word would quickly get through to them that it's time to stop reacting and start thinking. As our national organization, it is the League's responsibility to make sure that the hobby stays healthy and growing — two things it isn't.

Your membership in the League and your patronizing of their advertisers will guarantee that nothing changes. Your membership is your vote, backed with your money, for the League not to change. Your patronizing of *QST* advertisers is your vote for no change.

I watched the entire ham industry of the 1950s and early '60s commit suicide, supporting the League that was killing them. Hall-icers, National Radio, Gonset, Barker & Williamson, Millen, Hammarlund, Multi-Elmac, Central Electronics, Sideband Engineers, Galaxy, World Radio, and so on all went bankrupt at the hands of the League. Every single major ham equipment company and about 90% of the ham dealers folded within a couple of years, loyally advertising in *QST* until they went out of business.

I don't think anything is going to change. Old-timers will not be able to stop themselves from renewing their League membership. Amateurs will not be able to stop themselves from patronizing the manufacturers and dealers who are the life blood of the League.

Meanwhile, the youngsters who we used to be able to recruit have (a) very likely never heard of amateur radio and (b), if they have, don't see why they should face the code barrier when they can already talk anywhere in the world on the Internet for a lot less money and effort. And without interference or the neighbors complaining about TVI or their ugly tower.

Tell me: When was the last time you saw amateur radio mentioned in any of the national media. Seen anything on TV? Amateur radio is following CB into oblivion in the mass consciousness. Hello, Newington, is anyone home?

#### Y2K Law Passed

The Year 2000 Information and Readiness Disclosure Act, a new law, provides protection from liability for statements in Year 2000 readiness claims. And that's even if the statements turn out to be inaccurate! That's undoubtedly a big disappointment to lawyers, some of whom have been predicting that Y2K suits will tie up the courts for years and result in billions of dollars in damages being paid.

Gee, too bad.

But, on the other hand, the law seems like a license for businesses to stop spending so much money trying to solve their Y2K problems. Oh well, a few months from now we'll know whether Y2K was the predicted speed bump in the road or a catastrophe which put the whole world out of business. I can hardly wait. In the meantime, I think I'll make sure I have some dependable emergency power for my rig. Just in case. Hey, you never know.

#### Y2K Bad News

The big midwestern utility,

Alliant Energy, is advising some customers to buy their own power generators if they want to be sure they have power in 2000. Alliant is also asking regulators for a \$16.1 million rate hike to cover the costs of Y2K computer repairs. Though they've been working diligently on the problem, with 176,000 pieces of equipment and 6,000 vendors and suppliers, it's now clear that everything won't be fixed in time, so they're warning their customers.

I suspect that the only difference between Alliant and the rest of the power industry is that Alliant is being honest. We've seen many examples of how some small problem in the power grid can shut down large areas of the grid. The domino effect. So, with thousands to millions of embedded chips that need to be found and replaced, how ready are you going to be in the dead of next winter if your power shuts off for a few hours, days, or weeks?

Last winter, when the worst ice storm in history hit the Northeast, we lost power for almost a week, and we were far more fortunate than thousands of other families. We moved to a motel 25 miles away, where they still had power. We could have bundled up and survived, but it would have made the event a lot less memorable.

How well prepared are you to celebrate New Year's Eve this year?

#### Y2K Again?

Well, where else are you going to keep up with the hand wringing over the inevitable "bump in the road" or "terrible catastrophe"?

Perhaps FDR hit it on the head when he said, "We have nothing to fear except fear itself." But fear can be a powerful motivator. I know that if I were living in a city I'd be starting to get edgy about being near there come New Year's Day.

There's an increasing awareness that, though many banks are Y2K compliant, all it could take to topple the dominoes

would be a few non-compliant banks anywhere in the world network. Or is it a house of cards? Anyway, the Fed is banking (pardon) on there being some extra cash demands from panicky bank customers, so they're printing an extra \$50 billion. Hmm, let's see, with 350 million people that's only \$150 each. That's not going to keep the ATM machines in business for long.

It could start to get tight later this year as businesses that deal in cash start putting some of it aside instead of banking it, "just in case." Some more prudent businessmen will be drawing cash from their businesses and putting it aside.

Hmm, what would happen to our cash supply if people in other countries start worrying about their banks and the value of their currency and start hoarding dollars? Hey, just in case, you know.

If cash gets in short supply its value will go up, with some predictions of a five or ten times increase. The potential for this bonanza will help encourage more people to hoard cash. Just in case, of course.

Yes, I know, the banks have almost all of your money out in loans and mortgages, so their cash cushion is very thin. If more than 3% of their customers want their money, the bank has to close its doors. Another house of cards.

Say, have you got some emergency power up and running for your ham station, or are you dependent on the power grid and gas stations?

When Art Bell asked power company employees to call in to his show, a bunch of them said that their supervisors at their power company were busy buying home generators and solar power systems. Hmmm.

*Business Week* had a short note reporting that the Gartner Group tech think tank says 83% of the current off-the-shelf software may have Y2K problems, down from 89% a year ago. Well, now, *that's* progress!

#### Exporting Jobs

Maybe you've noticed that all of the big companies are going international. Many are even moving their headquarters to other countries. So what does that mean to Joe Blow from Windy City? Nothing, if Joe is self-employed, but if he's a blue or white collar worker with a big company, it means that he's in competition for his job with an awful lot of better educated, higher-skilled workers in countries with far lower wages, fewer benefits, and less restrictive labor laws.

With communications and shipping costs continuing to drop, smaller and smaller companies are outsourcing their work in lower wage countries.

A few years ago, when my software company got fairly large, I got into serious talks with the Irish government. They wanted me to move my software development division to Ireland and they offered to do almost anything it took to get the jobs for Ireland. They'd train the workers, help pay for the new building, and give me a ten year tax break.

When I was a kid it was a big deal to get any clothes that were not made in the USA. Imported! Wow! Now my shoes were made in China, my shirt in Malaysia, and my pants in United Arab Emirates. I looked at another shirt and it was made in South Africa; my new pants are from Pakistan. My jogging suits are from Bangladesh and the Dominican Republic, and my Nike running shoes from China. My business suit is from Hong Kong and my blazer from Korea, like my snow boots. My watch is from Japan, of course.

It wasn't that many years ago that New Hampshire was a major shoe manufacturer. Now all we have are a bunch of huge old crumbling factory buildings.

Alas, our school system, which was set up on a factory production system to turn out workers for our factories, is still doing just that — it's just



that the factories are now in other countries and our graduates have nowhere to go for good-paying jobs. The workers are piling up in the warehouse as they come off the public school and college conveyor belts.

### Earthquake?

No, I suspect that rumbling sound we've been hearing is the turning of the framers of the Constitution in their graves. Ben Franklin, Washington and the rest of them never imagined what the government they founded a couple hundred years ago would evolve into, despite their best efforts in writing the Constitution to prevent just what's happened.

Maybe you saw the *60 Minutes* segment on how much politicians are depending on focus groups these days. These groups not only tell politicians what to think, but how best to manipulate the people to go along with their skullduggery. They pointed out how Clinton's handlers consult focus groups before his every speech, and we the people, hearing the spin aimed at what they've found we want to hear, believe what we're hearing.

Then there are the thousands of paid lobbyists in Washington, distributing tens of millions of dollars to the Congress we elected. And keep right on electing, no matter how crooked they are. The companies and unions footing the lobbyist bills are obviously getting what they've paid for, otherwise the money spigot would get turned off.

I was amazed at the list of registered lobbyists here in New Hampshire. They're in every state capitol, their bags of money at the ready to influence legislators.

Did you see the *60 Minutes* segment about how the Forest Service got the local police to raid the home of a guy who had property they wanted? They claimed they had spotted some marijuana plants growing on his property from the air. So the police moved in, shot the property owner,

and confiscated his property. No, no marijuana was found.

Hmm, interesting. Say, how are the Red Sox doing?

### Economics I

You haven't been paying much attention to the trade deficit, have you? Tsk.

Let me explain what's going on in simple terms. If your family expenses are greater than your income, you're going to have to either sell off assets to pay your bills, borrow money, or go into debt. The problem with debt is that your creditors will only put up with so much of it. They want their money!

Your income and net worth limit how much you can borrow.

Nothing new there, but what you may not have considered is that the same rules apply to any business, and that includes the business of running towns, states, and even countries.

A business has to sell products or services to bring in money. So does a state, and that means selling products outside of the state, not just moving money around within the state. Ditto the country.

If the US buys more imported products than it sells to other countries, it's going to go into debt. We can, to some degree, borrow money to cover our extravagance, but creditors do not have unlimited patience or credulity.

With more and more of our manufacturing moving to lower wage, higher educated work forces in other countries, we have less and less to sell, so our trade deficit has been soaring.

Lower wages? If you were a manufacturer paying \$8 to \$10 or more an hour for work, would you get interested in moving your plant to Mexico, where the average wage is \$1.60 an hour, and the shipping only takes hours to the US, with no import taxes? Or perhaps you'd start looking at China, where the average wage is 40¢ an hour and it takes about three weeks to ship in the products.

We long ago lost our consumer electronics industry to

Japan. This was no accident. The Japanese Ministry of Industry and Trade (MITI), applying Demming's teaching about quality, took this high-profit industry away from us. And look what they've done to the car market we've done to own! And tools, cameras, and so on for many high-profit industries.

Our low-profit industries have moved into dozens of low-wage countries. Most of our clothes and shoes are being made overseas, and that's a huge industry.

More and more, what we have to sell is intellectual property — movies, CDs, books, and software. But how long will we be able to make money selling these products if they are available for free via the Internet? And that's where things are headed with the Web.

Web-distributed books can include just about anything imaginable in graphics, including video. My Data-Diskman lets me read books which are stored on disks the size of a 3.5" not very floppy. How long before I'll be able to dump more books to disks via the Web?

So, how, with the way things seem to be going, can the US work its way out of trade deficits? Well, one way we're ahead of the rest of the world is in commercial farming. I'd like to see our school system improved so we could again be world leaders in intellectual work — high-tech, inventing, and artistic creativity. But if we could improve the value of our crops, I'll bet we could again have a trade surplus.

I'm suggesting bigger, better tasting, faster growing, healthier-to-eat farm produce. We have the technologies to do this, but like many other new technologies, we're not bringing them on line. Oh, I guess we did pretty well with personal computers. I started the first personal computer magazine in 1975, just 24 years ago, and despite the resistance of the then entrenched computer industry, our microcomputers are now ruling the world. And, mark you, it

isn't the microcomputers that are going to crash at Y2K, it's the embedded chips and old mainframe computers.

We know how to grow much, much better crops — using Sonic Bloom, ground rock "fertilizer," magnets, and so on — we just haven't been getting the word out to counter the chemical conglomerates selling NPK fertilizer and the pesticides their use makes necessary.

Well, I admit I've written about most of this before, so stop complaining and get busy helping to change the system which is bleeding us with trade deficits.

### Microbroadcasting

A judge has ordered Free Radio Berkeley off the air! I can understand the FCC's need to stem the chaos that thousands of microbroadcasters might cause, but they'd do better to recognize the need for such a service and set about organizing it instead of fighting it.

These small broadcasters rarely are causing interference to the commercial FM stations, and they provide an outlet for special interest information and entertainment that doesn't have a large enough constituency to support a commercial FM station — which costs hundreds of thousands to millions of dollars to establish.

As broadcasting via the Internet gets more popular, this will provide an international audience for more microbroadcasters, but it'll be a while before we'll be able to tune in Web broadcasters on our car radios and Walkmen.

There are an estimated thousand microbroadcasters at present, so the FCC has an expensive road ahead if they are going to try to shut them all down. Will Congress endorse the budgeting of several million dollars to track down and put these little entrepreneurs out of business?

### Ear Plugs

*Continued on page 61*



# PROPAGATION

Jim Gray W1XU/7  
210 E Chateau  
Payson AZ 85541  
[jimpeg@netzone.com]

## June

A quick look at the calendar shows very few Good (G) days for HF propagation (DX) this month. "Conditions" on most days are trending between Good to Fair (G-F) or Fair to Good (F-G). The really Poor (P) and Very Poor (VP) days anticipate disturbances in Earth's magnetic field and ionosphere due to solar flares or other solar phenomena; they are expected from the 11th to the 14th and again on the 29th and 30th.

DX propagation conditions during the day following recovery from a geomagnetic storm (unsettled to active ionosphere) are often very, very good — specifically on June 15th and 16th, and July 1st and 2nd.

Midsummer days usually show poor DX conditions compared with spring and fall, because ultraviolet radiation from the Sun during the peak hours of daylight (northern hemisphere tilted toward the Sun) causes the ionosphere to absorb instead of reflect (refract) HF band signals. However, VHF signals can benefit at such times, and when HF bands are particularly poor, 6 and 2 meters could provide some excellent DX opportunities. (See band-by-band forecast.)

## July

July is never a particularly good month for DX on the HF bands due to high signal absorption levels, and particularly this July because we are in the early stages of sunspot cycle 23, in which the solar flux values remain disappointingly low. VHF can be quite good, along with meteor scatter opportunities

(Delta Aquarids) for about ten days beginning July 29th.

Your best time to work HF band DX will be the 3rd-6th, 19th-21st, and the 25th. The poorest days are likely to be the 13th-17th and the 31st. Remaining days will be Fair or trending between one condition and another (see calendar).

There will be a partial lunar eclipse on July 28th, visible in parts of Antarctica, southern and western parts of South America, Central America, parts of North America (except north of Alaska), the Pacific Ocean, Australasia, and eastern parts of Asia.

By the way, if you're interested in weather and other geophysical phenomena, keep a sharp lookout for "conditions" surrounding the 13th and 26th and *semper paratus*.

*Please note that the band-by-band forecast and the band-time chart are the same for both June and July.*

## Band-by-band forecast

### 10-12 meters

Possible short-skip opening due to sporadic-E ionization out to 1300 miles should occur on most days, and to occasionally longer distances on a few days.

### 15-17 meters

Regular north-south path openings and occasional openings toward Europe and Africa peaking during local afternoon hours can be expected.

### 20 meters

This is likely to be the best band for worldwide propagation

June 1999						
SUN	MON	TUE	WED	THU	FRI	SAT
		1 F	2 F	3 F-G	4 G-F	5 F
6 F	7 F	8 F-G	9 G-F	10 F-G	11 G-F	12 F-P
13 P-VP	14 P	15 P-F	16 P-F	17 P-F	18 F	19 F-G
20 G	21 G-F	22 F-P	23 P-F	24 F-G	25 G-F	26 F
27 F	28 F	29 F-P	30 P			

of signals that will be strongest an hour or two after local sunrise and again in the late afternoon and early evening hours. Short-skip beyond 500 miles should be good as well.

### 30-40 meters

You can expect DX openings during local evening, nighttime, and sunrise hours, limited by high noise levels due to thunderstorms along the

signal path. Peak conditions occur toward the east around midnight and in other directions just before sunrise. Short-skip up to 1000 miles should occur during daylight hours, and 500-2300 miles at night is likely.

### 80 meters

Some short-skip propagation of 250 miles or so may occur during daylight hours and to

EASTERN UNITED STATES TO:												
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA												
ARGENTINA	10/15	20	20	20	20						10/15	10/15
AUSTRALIA	15	15	15/20	15/20	40/80	40/80	20					15
CANAL ZONE	15	20	20	20	40	40	20	20	20		10	15
ENGLAND	20	20	20		40						20	20
HAWAII	15	15	15/20	20	40/80	40/80						15
INDIA	20	20										
JAPAN							20	20				
MEXICO	15	20	20	20	40/80	40/80	20	20	20		10	15
PHILIPPINES	15	15	15/20	15/20	40/80	40/80	20					
PUERTO RICO	15	20	20	20	40	40	20	20	20		10	15
RUSSIA (C.I.S.)	20	20										20
SOUTH AFRICA			40/80	40/80	20	20	20				20	20
WEST COAST	40/80	40/80	40/80	40/80	40/80	40/80	40/80		10/20	10/20		
CENTRAL UNITED STATES TO:												
ALASKA							40/30	20				
ARGENTINA	15/20	20/40	20/40								15	15/20
AUSTRALIA	15			20	20/40	20/40	20/40					15
CANAL ZONE	20	20	20	40/80	40/80		20	20	15	15	10	10
ENGLAND	20	20	20/30	40	40		20	20				20
HAWAII	15	15	20	20	20/40	40	40	20	20			15
INDIA			20	20								
JAPAN						40/80	40/80	20	20			
MEXICO	20	20	20	40/80	40/80	20	20	15	15	10	10	
PHILIPPINES	15			20	20/40	20/40	20/40					15
PUERTO RICO	20	20	20	40/80	40/80		20	20	15	15	10	10
RUSSIA (C.I.S.)	20	20	20					20				20
SOUTH AFRICA				20/40	20/40	20						
WESTERN UNITED STATES TO:												
ALASKA						20	20	40/80	20	20		
ARGENTINA	15/20	15/20	20	20	40	40						15
AUSTRALIA	15	15	15	20	20		40/80	20/40	20			
CANAL ZONE	10/15	15/20	15/20	20/40	40	40		20	20			10
ENGLAND	20	20										
HAWAII	15	15	15	20	20/40	20/40	40		20	20		
INDIA								20	20			
JAPAN				20	20	40/80	40/80	20	20			
MEXICO	10/15	15/20	15/20	20/40	40	40		20	20			10
PHILIPPINES	15	15	15	20	20		40/80	20/40	20			
PUERTO RICO	10/15	15/20	15/20	20/40	40	40		20	20			10
RUSSIA (C.I.S.)	20	20	20					20	20			20
SOUTH AFRICA					20	20						
EAST COAST	40/80	40/80	40/80	40/80	40/80	40/80	40/80		10/20	10/20		

## NEVER SAY DIE

continued from page 59

A clipping from Frank KD4DZI says that FCC Chairman Kennard is pushing for a system that would permit the licensing of low power broadcasting stations which could cover a radius of two to six miles. Hark, what is that knocking sound? Good heavens, it's not the radiator pipes, it's the knock of opportunity for any amateurs with initiative.

No, I'm not talking about changing your living room into a broadcasting studio, I'm talking about the tens of thousands of religious and other special interest groups who will want to take advantage of the opportunity to reach out into their communities with their messages. They're going to need a lot of help in getting the equipment they need, connecting it together, setting up the antennas, and maintaining everything. And that could provide a whole new industry.

Companies like Ramsey will certainly be out there with transmitters. But there's going to be a need for small operating consoles, "on the air" signs, and so on. They're going to need CD, cart, LP, and cassette players, and so on. The more progressive may want to convert their dining room into a studio, complete with a grand piano, so they'll need help in the design and soundproofing of the room.

My recording studio was built with no two surfaces parallel, so there are no resonances. And one wall is made

of doors with mirrors on one side and foam sound-absorbent material on the other so the ambience of the room is adjustable. We're in the digital sound age, so the studios, microphones, and everything in the line has to be as perfect as possible.

Any good studio has to have a grand piano, naturally. My recording star, Scott Kirby, tried out a couple dozen grands at the Boston Steinway store before finding a Korean Young Chang piano that he felt outperformed anything else they had. It has a fantastically brilliant high end which is critically important for the music of Joplin and Gottschalk.

When the FCC chairman says he's pushing for a new service, it's time to start laying plans for taking advantage of what will probably come. Or you can watch a ball game.

### More Health News

Yeah, this is supposed to be a ham radio magazine, so why am I annoying you with all this health crap? Two reasons. First, I seriously doubt that you are going to find out about most of the health stuff I write about unless I annoy you with it. Secondly, you are much more than a subscriber to me. When I find out something that could make your life happier, I feel obligated to do my best to let you know about it. I guess it's part of a genetic fault that makes me want to share anything which I particularly enjoy with as many people as I can.

So I keep after you to listen to classical music. To learn to

ski. To try scuba diving. I still remember the day I discovered Beethoven's Sixth Symphony. I bought the album, put it on the record player, turned up the volume, and played it endlessly with my head right next to the speaker. Or the many times while I was in the navy in San Francisco that I played Chabrier's España at the USO on Geary Street. I still love those pieces.

Perhaps I'm feeling a little defensive. I got an E-mail from a chap who bitched about my despoiling a ham magazine with health information. Didn't have the guts to give his call. Fortunately for my peace of mind, the encouraging letters and E-mail are almost all positive. Thank you!

Now, down to the meat. Aspartame. Again. This is important enough so I've put together a four page pamphlet on the subject, but the message is clear — if you drink diet drinks or eat foods containing aspartame, a.k.a. NutraSweet, Equal, Spoonful, you can cause yourself some very serious health problems.

The recent escalation in multiple sclerosis cases has been traced to aspartame. It can cause similar symptoms, but when people stop using aspartame, the symptoms gradually go away. Not so with lupus, which has also been traced to aspartame. Stopping does not result in any improvement — it just stops the lupus from getting worse.

If you suffer from fibromyalgia symptoms, numbness in

your legs, spasms, shooting pains, headaches, vertigo, dizziness, tinnitus, anxiety attacks, blurred vision, slurred speech, or memory loss, you probably have aspartame disease. It's also been tied to the dramatic increase in Alzheimer's Disease and Parkinson's. Are you using that little blue package for your coffee?

So what's going on here that's causing all the trouble? When the temperature of aspartame goes above 86° F (as it does in your stomach), the wood alcohol in aspartame converts to formaldehyde and then to formic acid. This causes metabolic acidosis. Formic acid is the poison used by fire ants. The methanol toxicity mimics multiple sclerosis.

I should mention that it also causes birth defects.

Yes, aspartame is supported by the FDA and AMA. Of course, that's where the money is. So who can you trust? Lawyers? Doctors? Dentists (think amalgam fillings)? Politicians? The police? The IRS? Clinton? Ted Kennedy (hey, tell us about Mary Jo, Ted!)? Any branch of the government? I don't ask you to trust me on anything I say, but I do give you reliable references to back me up. Turn off that damned TV and start reading.

You can get copies of my four page aspartame booklet to read and give to anyone you care about. Please help me get the word out on this menace that Monsanto has unleashed on us. Send me \$1 and an SASE and I'll send you three booklets. That'll get you started. 73

### July 1999

SUN	MON	TUE	WED	THU	FRI	SAT
				1 F	2 F-G	3 G
4 G	5 G	6 G	7 G-F	8 F	9 F	10 F
11 F	12 F-P	13 P	14 P	15 P	16 P	17 P-F
18 F-G	19 G	20 G	21 G	22 G-F	23 F	24 F-G
25 G	26 G-F	27 F	28 F-G	29 G-F	30 F	31 F-P

2,000 miles or so at night, but no daytime DX will take place due to signal absorption. During hours of darkness and just before sunrise, however, DX is possible to some areas of the world.

High noise levels due to thunderstorms along the signal path will limit both short-skip and DX communication.

### 160 meters

No daytime propagation expected, but some DX and short-skip propagation should take place at night in spite of high static noise levels. 73

#### Back Issues

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# Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

**Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls.** The deadline for the September 1999 classified ad section is July 10, 1999.

**President Clinton** probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. Check it out at [www.ohio.net/~rtormet/index.htm]—over 100 pages of circuits, tables, RF design information, sources, etc.

BNB530

**DFJr direction finder** and MicroPLL programmable transmitter (formerly Agrelo) are now back under new management! Check exciting new accessories and upgrades. Order online at [www.swssec.com](http://www.swssec.com) or call SWS Security at 410-879-4035 (9-5 ET).

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**Cash for Collins:** Buy any Collins Equipment. **Leo KJ6HI**. Tel./FAX (310) 670-6969. [radioleo@earthlink.net] BNB425

**MAHLON LOOMIS, INVENTOR OF RADIO**, by Thomas Appleby (copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM N3RF**, SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044. Please send \$25.00 donation with \$5.00 for S&H.

BNB420

**METHOD TO LEARN MORSE CODE FAST AND WITHOUT HANGUPS** **Johan N3RF**. Send \$1.00 & SASE. SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044 USA. BNB421

**Great New Reference Manual** with over 100 pgs of P/S, transistor, radio, op-amp, antenna designs, coil winding tables, etc. See details at [www.ohio.net/~rtormet/index.htm] or send check or M.O. for \$19.95 + \$2.00 P&H to RMT Engineering, 6863 Buffham Rd., Seville OH 44273. BNB202

**QSL CARDS.** Basic Styles; Black and White and Color Picture Cards; Custom Printed. Send 2 stamps for samples and literature. **RAUM'S**, 8617 Orchard Rd., Coopersburg PA 18036. Phone or FAX (215) 679-7238. BNB519

**WANTED:** High capacity 12 volt solar panels for repeater. [kk4www@fairs.org] or (540) 763-2321. BNB2630

**COLLOIDAL SILVER GENERATOR!** Why buy a "box of batteries" for hundreds of dollars? Current regulated, AC powered, fully assembled with #12 AWG silver electrodes, \$74.50. Same, but DC powered, \$54.50. Add \$2.50 shipping. **Thomas Miller**, 314 South 9th Street, Richmond IN 47374. BNB342

**ASTRON** power supply, brand-new w/warranty, RS20M \$99, RS35M \$145, RS50M \$209, RS70M \$249. **AVT**. Call for other models. (626) 286-0118. BNB411

**Wanted:** ICOM UX-R96 and UX97 plug-in modules for an ICOM 970. **Randy Ballard N5WV**, (903) 687-3002. BNB175

**HEATHKIT COMPANY** is selling photocopies of most Heathkit manuals. Only authorized source for copyright manuals. **Phone:** (616) 925-5899, 8-4 ET. BNB964

**Electricity, Magnetism, Gravity, The Big Bang.** New explanation of basic forces of nature in this 91-page book covering early scientific theories and exploring latest controversial conclusions on their relationship to a unified field theory. To order, send check or money order for \$16.95 to: American Science Innovations, PO Box 155,

Clarington OH 43915. Web site for other products [http://www.asi\_2000.com]. BNB100

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**Wanted:** ICOM IC-970. Must be in mint condition, non smoker. Also looking for the following ICOM sales brochures: IC-275, 575, 375 and 970. **Randy Ballard N5WV**, (903) 687-3002. BNB75

**TELEGRAPH COLLECTOR'S PRICE GUIDE:** 250 pictures/prices. \$12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

## LETTERS

*continued from page 6*

peaters in the United States, took an arbitrary average area of coverage, and came up with twenty million miles of three-dimensional coverage.

In the early to mid-sixties, many of my high school friends were on CB radio after school. They used their parents' radios to communicate in an "after school" and many times an "all night long" net. Was that the Family Radio Service of the sixties?

Wouldn't it be nice if we introduced the public to the fact that there is a whole other communications network that is free, uses the same size, shape, and style of radio they are using now, and requires a relatively simple test? That they can communicate almost anywhere in the United States and the world? That they can use their radio to communicate when normal communication channels (such as land line or cell phone) are out during a disaster? That they can even talk to the Space Shuttle?

And wouldn't it be nice if the public, when learning about this fantastic free ham radio, would learn that they could even connect their computers to their radios and use the computer to communicate without the need of phone lines? And what about all the other modes of operation available to amateur radio operators? Do you

think that some interest may be generated once the public knew about it? I think so.

So, what are we missing here? We as the amateur radio community, hams, need to take advantage of the FRS communications frenzy and market to the public the fact that they can communicate "twenty million miles" using ham radio.

Clubs have to become active and place listings in community newspapers. "Family Radio Service = 2 miles. Amateur Radio Service = 20,000,000 miles. Learn how!"

Set up "public information booths" at the local malls.

Place club and licensing information at local electronics stores.

Get back into the schools and let the students know about ham radio. Explain how repeaters will allow them to communicate with their friends even if they are at the baseball game.

As individuals, carry some ham radio promotional material with you explaining about the hobby. Pass this information to families you see using the FRS. Believe me, they won't bite you!

Each year in recent history, we have seen the dwindling of the number of amateur radio operators. We have the ability to convert many Family Radio Service users to Amateur Radio Service users.

Let's do it!

73



Here are some of the books Wayne has written. Some can change your life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, you can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

**The Secret Guide to Health:** Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. \$5 (H)

**The Secret Guide to Wealth:** Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (M)

**The Secret Guide to Wisdom:** This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (B)

**Cold Fusion Overview:** This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (C)

**The Bioelectrifier Handbook:** This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book. \$10 (A)

**Moondoggle:** After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronauts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. \$5 (D)

**Mankind's Extinction Predictions:** If any one of the experts who have written books predicting a soon-to-

come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who had recently warned his followers to get out of Japan and Australia before March 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready. how about you? \$5 (E)

**Wayne's Submarine Adventures in WWII:** Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. \$5 (S)

**Improving State Government:** Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (L)

**Travel Diaries:** You can travel amazingly inexpensively - once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under \$1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. \$5 (T)

**Wayne's Caribbean Adventures:** More budget travel stories - where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. \$5 (U)

## Radio Bookshop

**Silver Wire:** With two 3-in. pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. \$15 (Y)

**Classical Music Guide:** A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (Z)

**Reprints of My Editorials from 73.**

**Grist I:** 50 of my best non-ham oriented editorials from before 1997. \$5 (F)

**Grist II:** 50 more choice non-ham editorials from before 1997. \$5 (G)

**1997 Editorials:** 240 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. In three \$5 volumes. \$15 (O)

**1999 Jan-Aug Editorials:** 188 pages in two \$5 volumes. Bringing you up to date. \$10 (P)

**Ham-to-Ham:** 45 of my ham-oriented editorials. These will help you bone up on ham history. Great stuff for ham club newsletter filler. Yes, of course these are controversial. \$5 (Q)

**\$1 Million Sales Video:** How to generate extra million in sales using PR. This will be one of the best investments your business ever made. \$43 (V)

**One Hour CW:** Using this sneaky method even you can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. \$5. (CW)

**Code Tape (T5):** This tape will teach you the letters, numbers and punctua-

tion you need to know if you are going on to learn the code at 13 wpm or 20 wpm. \$5 (T5)

**Code Tape (T13):** Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. \$5 (T13)

**Code Tape (T20):** Start right out at 20 wpm and master it in a weekend for your Extra Class license. \$5 (T20)

**Code Tape (T25):** Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six months. \$5 (T25)

**Wayne Talks at Dayton:** This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. \$5 (W1)

**Wayne Talks at Tampa:** This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. \$5 (W2)

**Stuff I didn't write, but you need:**

**NASA Mooned America:** René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$25 (R1)

**Last Skeptic of Science:** This is René's book where he debunks a bunch of accepted scientific beliefs - such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. \$25 (R2)

**Elemental Energy Subscription:** I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. \$30 for six issues. (EE). A sample issue is \$10.

**Three Gatto Talks:** A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world. \$5 (K)

.....Wayne

## Radio Bookshop

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Items ordered - use letters or copy page and mark books wanted. Order total plus \$3 s/h in US, \$6 Can. US\$

Foreign orders: \$10 s/h surface shipping. Lord knows what airmail will cost - make a good guess. Allow 4 weeks for delivery except foreign, though we try to get most orders shipped in a day or two.

MC/Visa for orders over \$10. # \_\_\_\_\_ Expire \_\_\_\_\_  
Phone orders: 603-924-0058 • 800-274-7373 • fax: 603-924-8613

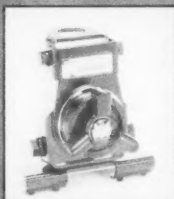
Yes! Put me down for a year of 73 for only \$25 (a steal). Canada US\$32.  
Foreign US\$44 by sea, US\$67 by air. Whew!



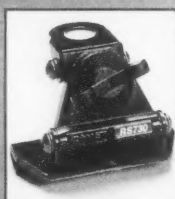
**Go Mobile, get there with**

**COMET!**

## Lip Mounts



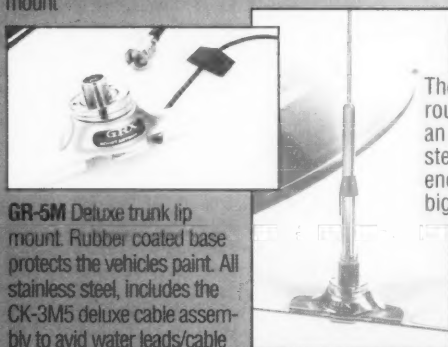
**RS-720 • RS-720 NMO** Multi-adjustable lip mount, up to 60" antenna RS-720 NMO accepts an NMO mount



**RS-730** Multi-adjustable heavy duty lip mount, up to 70" antenna

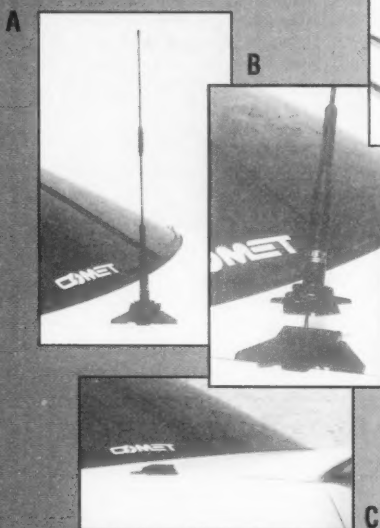


**RS-520** Multi-adjustable lip mount, up to 45" antenna



**GR-5M** Deluxe trunk lip mount. Rubber coated base protects the vehicles paint. All stainless steel, includes the CK-3M5 deluxe cable assembly to avoid water leaks/cable damage when shutting the trunk. Four large set screws hold it securely in place. Two offset washers adjust the antenna to vertical. Gold-plated SO-239/PL-259 connectors.

The **GR-5M's** smooth rounded corners make an attractive stainless steel mount strong enough to hold the biggest antennas.



**CQ-5M** "Quick-disconnect" trunk lip mount. Rubber coated-base protects the vehicles paint. Includes the CK-3M5 deluxe cable assembly avoiding water leaks or cable damage when shutting the trunk. Gold-plated SO-239/PL-259 connectors.

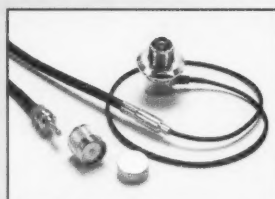
**COMET's** newest and most unique truck lip mount, the **CQ-5M**. Mounts to any trunk lid and adjusts to vertical with two offset washers. The mount base supports even the largest dualband or HF antenna.

**A) CQ-5M** trunk lip mount with **COMET SBB-2** 2M/70cm antenna.

**B)** Quick-disconnect lever releases the antenna and connector for long term storage in your trunk, to use a car wash, or theft prevention.

**C)** The low profile base is the only thing that remains when the antenna is removed, ready for instant re-attachment.

## Cable Assemblies for Lip Mounts



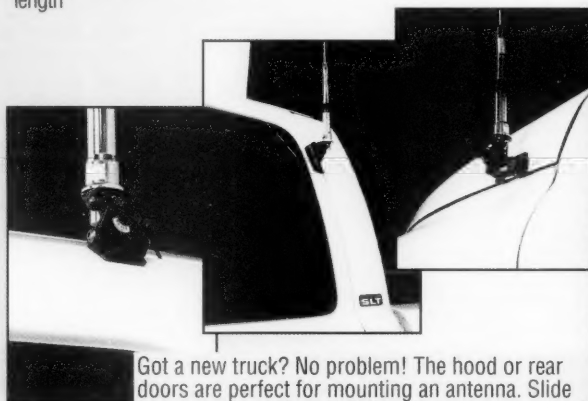
**CK-3M5** Deluxe cable assembly 17' length including 17" of RG-188A/U for easy entry from a lip mount without causing water leak, wind noise or coax damage

**CK-3M** Deluxe cable assembly same as CK-3M5, but 9'9" total length



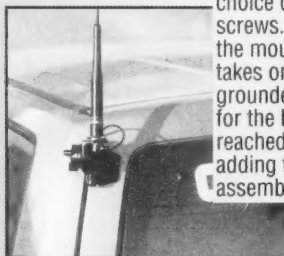
**3D5M** Standard low loss cable assembly. Gold plated SO-239/PL-259 connectors. 17' length

**3D4M** Same as 3D5M, but 13.5' length



Got a new truck? No problem! The hood or rear doors are perfect for mounting an antenna. Slide the mount over the lip, tighten the set screws, and adjust it to vertical. No holes to drill, the mount is grounded and installation takes only a few minutes. Choose the deluxe or standard cable assembly in the length required.

Going mobile is easy with **COMET** products, and there are no holes to drill. The rear doors on VAN's and SUV's are the perfect place to mount an antenna. Simply lift or open the rear door, slide your mount of choice over the lip, then tighten the set screws. Soft rubber protects the paint, and the mount adjusts to vertical. Installation takes only a few minutes. The mount is grounded, the antenna is above the roof line for the best performance and is still easily reached if needed. Complete the system by adding the standard or deluxe cable assembly in the appropriate length.



# COMET™



1275 N. Grove Street • Anaheim • California 92806  
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**Go Mobile, get there with** **COMET!**

**NEW MH-209SMA** • Dual-band 146/446MHz HT Antenna w/SMA Conn  
Gain & Wave: 0 1/4 wave • Length: 3' Flexible rubber • Conn: Male SMA • Max Pwr: 5W

**NEW SMA-503** • Dual-band 146/446MHz HT Antenna w/SMA Conn  
Length: 8.75' • Conn: Male SMA • Max Pwr: 10W

**NEW MH-510** • Tri-band 52/146/446MHz HT Antenna w/SMA Conn  
Gain: 0/0 3/2dBi • Length: 20.75' • Conn: Male SMA • Max Pwr: 10W

**SB-15** • Tri-band 52/146/446MHz w/fold-over  
Gain & Wave: 52MHz 0dBi 1/4 wave • 146MHz 4.5 dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: PL-259 • Max Pwr: 120W

**NEW BLACK COLOR**  
**SBB-7** SBB-7NMO • Dual-band 146/446MHz w/fold-over  
Gain & Wave: 146MHz 4.5dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: SBB-7 PL-259/SBB-7NMO NMO • Max Pwr: 70W

**NEW BLACK COLOR**  
**SBB-5** SBB-5NMO • Dual-band 146/446MHz w/fold-over  
Gain & Wave: 146MHz 2.5dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: SBB-5 PL-259/SBB-5NMO NMO • Max Pwr: 120W

**THEFT 2700** • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!  
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: Gold-plated PL-259 • Max Pwr: 200W

**THEFT 2700** • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!  
146MHz 6/8 wave 4.5dBi • 446MHz 5/8 wave x 3 7.2dBi • Length: 62" • Conn: Gold-plated PL-259 • Max Pwr: 150W

**B-20** B-20NMO • Dual-band 146/446MHz w/fold-over  
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.0dBi 5/8 wave x 2 • Length: 30" • Conn: B-20 PL-259/B-20NMO NMO • Max Pwr: 50W

**B-10** B-10NMO • Dual-band 146/446MHz cellular look-a-like •  
Gain & Wave: 146MHz 0dBi 1/4 wave • 446MHz 2.15dBi 1/2 wave • Length: 12" • Conn: B-10 PL-259/B-10NMO NMO • Max Pwr: 50W

- The CA-UHV is a 6M/2M/70cm triband antenna. Add 2-3 of the stock or optional coils for 5-6 band operation.
- HF-70cm all in one economical easy to mount antenna.
- Fold-over hinge built in.
- Select the correct duplexer or triplexer for your specific radio (s).
- CF-706A, CF-530, CFX-514N (Ask your dealer)

**NEW CA-UHV** • HF/6M/2M/70cm Mobile Antenna 40"/20"/17 1/2"/10 1/2"/6 1/2"/2M/70cm  
Gain & Wave: HF-6M 1/4 wave • 2M 3.4dBi 5/8 wave • 70cm 2.15dBi 1/2 wave • VSWR: HF 1.6:1 or less • 6M-70cm 1.5:1 or less • Length: 6'2" • Max Pwr: HF 120W SSB • 6M 200W SSB/100W FM • 2M/70cm 100W FM • \*L-14 Optional 20M coil • \*L-18 Optional 17M coil

**NEW MSG-1000C** • Dual-band 146/446MHz w/spring whip and fold-over  
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: PL-259 • Max Pwr: 120W

**NEW MSG-1100C** • Dual-band 146/446MHz w/spring whip and fold-over  
Gain & Wave: 146MHz 3.5dBi 1/2 wave • 446MHz 6.0dBi 5/8 wave x 2 • Length: 43" • Conn: PL-259 • Max Pwr: 150W

**NEW MSG SERIES\***

**Performance and Durability!**  
**Designed with a spring in the whip to absorb impacts.**

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# The New Approach to HF Radio!

## The Kachina 505DSP Computer Controlled Transceiver

### Features:

- Works with any Computer Running Windows 3.1, 95 or NT
- Covers all Amateur HF Bands plus General Coverage Receiver
- IF Stage 16/24 Bit Digital Signal Processing (DSP)
- II DSP Bandpass Filter Widths from 100 Hz to 3.5 kHz (6 kHz in AM Mode)
- Band Activity Display with "Point and Click" Frequency Tuning
- On-screen Antenna "Smith" Chart, Logging Software and Help Menus
- Automatic Frequency Calibration from WWV or Other External Standard
- "Snapshot" Keys for Instant Recall of Frequencies and Settings
- Optional Internal Antenna Tuner

**The Kachina 505DSP Computer Controlled HF Transceiver** After twenty years of building commercial transceivers in Arizona, Kachina has decided the time is right for a new approach to amateur radio. The Kachina 505DSP is nothing short of a revolution in HF transceivers.

**Why Use Knobs if You Have Windows?** The old-fashioned front panel has become too cluttered to be useful. Too many knobs, too many buttons. Kachina's 505DSP transceiver connects to your computer's serial port and is completely controlled under Windows™. With optional cables, the radio may be remotely located up to 75 feet away from your computer. Imagine combining a state-of-

the-art DSP transceiver with the processing power and graphics capabilities of your PC and you'll soon wonder why all radios aren't designed this way. Why settle for a tiny LCD display when your computer monitor can simultaneously show band activity, antenna impedance, heat sink temperature, SWR, forward and/or reflected power and a host of other information?

**16/24 Bit DSP/DDSP Performance** In addition to 100% computer control, the Kachina 505DSP offers exceptional 16/24 bit DSP/DDSP performance. IF stage DSP, "brick-wall" digital filtering, adaptive notch filters and digital noise reduction, combined with low in-band IMD and high signal-to-noise ratio, produce an

excellent sounding receiver. Sophisticated DSP technology achieves performance levels unimaginable in the analog world. The transmitter also benefits from precise 16/24 bit processing. Excellent carrier and opposite-sideband suppression is obtained using superior phasing-method algorithms. The RF compressor will add lots of punch to your transmitted signal without adding lots of bandwidth, and the TX equalizer will allow you to tailor your transmitted audio for more highs or lows.

**Seeing Is Believing** American-made and designed, and able to stand on its own against the world's best, the 505DSP is bound to set the standard for all that follow. But don't take our word for it. Visit our website at <http://www.kachina-az.com> for detailed specifications, to download a demo version of our control software, or to see a current list of Kachina dealers displaying demonstration models in their showrooms.

## KACHINA COMMUNICATIONS, INC.

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Phone: (920) 224-2253, Fax: (920) 224-7328

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